THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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1914 EDITION

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WORKMEN AND INCOME-TAX.

UNLESS Mr. Lloyd George and the present Government alter their tactics in relation to employé and employer, it is going to be bad for this country, because the British workman is being spoiled, and spoilt children generally end in ruin, not only to themselves, but to everyone connected with them. The latest budget of the Chancellor of the Exchequer is another sop to the workman at the expense of his master, by the increase in the income-tax. "Look you," in effect says Mr. Lloyd George, "I will not tax you, my poor hard-working man, but will tax the ill-gotten gains of your master," and the workman honestly believes the socialistic labour leader when he says that without the worker no one would have anything, and therefore the worker should have everything. Hence restlessness is increasing, the workers' demands are becoming more and more outrageous, and their insubordination is fast becoming a serious menace to all law and order. Yet this is at a time when the hours worked are shorter and wages higher than they have ever before been in the industrial history of this country, and we believe, taking everything together, the workman is better paid in this country than in any other country in the world. And yet the Government pats them on the back, calls them poor fellows, pities them, and frees them from taxation. Why is it that the hundreds of thousands of workmen who are well enough known to be earning wages of £4 a week and over are not asked to pay income-tax? Why do not the surveyors call for a return of the earnings of, say, the miners, shipyard workers, steel smelters, and workmen employed in other industries on piecework, many of whom are earning wages of from £4 to £10 per week? Apparently the occupants of all houses below a certain rental are not to be bothered by the surveyors, yet all clerks and members of the staff of any industrial undertaking cannot escape, as the firm must give a return of the salaries, and the poor individual with £180 or £200 a year, must pay, while the workman in the same firm earning a like sum or more escapes scot free. A clerk or draughtsman with £200 a year must pay income-tax, which is about equal to the sum of 6d. per week, while a workman with less responsibility, earning £300, pays nothing. If the employer must give a return of the salaries of his staff, why should he not be asked to include all workmen earning over £3 per week? Let the workmen be subjected to the inquisitorial searchings of the surveyor, and they will then begin to recognise at least what the income-tax means. Or why should it not be enacted that every man in receipt of a weekly wage of £4 should be paid in part with a 6d. stamp? Even if he do not earn £4 every week, he by paying the 6d. when his wages do amount to £4 is only paying his proportion of the tax at the rate per annum which he would have to pay if he received a salary of £200 a year. The man who was paid £5 would have a stamp, or stamps, equivalent to 1s. 6d. on his pay cheque, and so on in proportion. By this mean a vast sum of money would flow into the

National exchequer, which it is fully entitled to receive, and would receive were it not either for indifference or fear. We say "fear" because we believe that when once the machinery was put in motion to make the workman pay tax on his income there would be an immediate outcry and possibly fresh legislation.

Probably no tax is so hated by the British taxpayer as the income-tax, not because he hates to pay taxes—these he is aware must be paid somehow or other—but because it intrudes so much into his private business affairs, and because of the dictatorial, inflexible, and inquisitorial attitude adopted by the surveyors and commissioners. Moreover, it is often very difficult for a business man to say what his earnings may be for the current year, and frequently rather than appeal, which would mean a disclosure of all his affairs, probably to a commissioner who is a rival in his business, he agrees to be over-assessed.

Again, the anomalies of the method of income-tax assessment are so harassing to the average business and professional worker that he is induced to take every means to give an incorrect return. Quite recently a small firm which showed an actual loss on the year's working was called upon to pay income-tax on the higher scale on amounts which were either written off or allowed for; this course was necessary for the purpose of carrying on the business on a sound financial basis, but these amounts were not allowed by the surveyor. We believe there are many similar cases where firms have no profit to pay dividends yet must pay income-tax. Surely this ought not to be. There can only be a profit when everything has been paid and properly allowed for, and the stronghold of this country is the soundness of our business from a financial standpoint.

It is the industrial middle class who not only bear the burden of taxation, but are really responsible for the carrying on of this great country, and it is well for the workman and the Government to bear this in mind. Left to himself the workman would soon quarrel with his leader, as at least 50 per cent. of the workmen are only in the Union through actual fear; only recently a leader in the Durham Miners' Association boasted that "they succeeded, by approaching the management, in having some men paid off because they would not be members of the Association." At a Cumberland colliery a week or two ago the management were requested to collect the arrears of payment on behalf of the Union from some members who had got into arrears, or dismiss them, or ——! The management agreed, and the money was stopped off the men's wages at the colliery office. Some of the men are earning £4 and £5 a week, for an eight hours' day. The manager works 12 or 14 hours for little more, bears all sorts of responsibilities, and has to pay income-tax, while the "spoilt children" go free. Tyranny!

THE I.E.E. MODEL GENERAL CONDITIONS FOR CONTRACTS.

The perusal of the new edition of the "Model General Conditions for Contracts," which has recently been issued by the Institution of Electrical Engineers, carries our minds back 15 years. At that time the want of uniformity on the one hand, and the imposition of unfair conditions on the other, were fast making electrical contracting for public undertakings a lottery rather than a business, and with many misgivings as to the final success of our efforts, we embarked on a systematic attempt to educate public opinion to the injustice of the prevailing practices. For two years we examined week by week the publicly issued specifications for electrical plant, and commended or criticised the conditions attached to the contracts. The arbitrary character of some of the clauses almost passes belief to-day. The claim for the engineer to be the sole judge of any dispute was a very usual one; payment clauses were so drawn up that settlements were long delayed; contractors were to be responsible for many things over which they had little, if any, control, and often they were to follow the purchaser's whims in regard to the execution of the work and yet be responsible for the results. The controversy was carried to the floor of the Institution, and eventually a committee was appointed which drew up the first "Institution Model Conditions," which were issued in 1906. These represented the best practice of the time, and their gradual adoption eliminated the excesses of previous years. The lapse of time and the growth of a better spirit have rendered advisable a further consideration of the subject, and the new issue represents the result of the labours of another committee.

The new clauses show how far we have travelled along the path of mutually fair dealing. They are not perfect, but one may accept them *en bloc* without fear of being unfairly dealt with. In a few important points they differ from the 1906 Institution draft, and in some directions they follow the lead of the draft contract conditions prepared by the British Electrical and Allied Manufacturers' Association, while in others they take an independent line. We understand that the Council of the B.E.A.M.A. on May 21st formally adopted the text of the present edition. As a consequence, the I.E.E. Model Conditions will be used by members (in substitution for the Association's conditions) in respect of tenders to municipalities, district councils, public authorities, and in respect of all publicly-advertised contracts where full General Conditions are issued.

The first clause gives the usual definitions, and this is followed by the stipulation that the tenderer shall carefully examine the specification and drawings and obtain the engineer's ruling on all doubtful points.

Clause 3 deals with the sealed agreement, which is to be drawn up at the purchaser's expense wherever the contract value exceeds £100. The value of the surety is to be 15 per cent. of the value of the contract.

Should the contractor decline, or unduly delay, the completion of the agreement, it is open to the purchaser to annul the contract, the same rights being given to the contractor for the purchaser's default.

In the next clause, dealing with drawings, which are to be furnished by the contractor and signed by the engineer acting on behalf of the purchaser, it is stipulated that the engineer is not to be held responsible for mistakes made in the drawings by the contractor, unless such mistakes are the result of incorrect information given to the contractor by the engineer. This is a decided advance, as hitherto there has been an implication that once the engineer signed the drawings, he was responsible for any and all the contractor's mistakes they might embody. Paragraphs follow dealing with sub-letting, which is not to be done without the consent of the engineer, which is not to be unreasonably withheld; indemnity against patent actions, and quality of materials. All tools, haulage, tackle and labour are to be found by the contractor, who will be supplied free with a reasonable amount of water, but he must find all hose, tanks and cocks. The next stipulation expressly relates to street work, and places on the contractor the duty of providing temporary footways, guards, fencing and lighting.

The engineer is to have power to vary or alter the work during progress, with the provisoes that any extra work is to be paid for, and, without the consent of the contractor, the total variation from the contract price is not to exceed 10 per cent. An important improvement in this clause is the power given to the contractor to protest against any alteration which may affect any obligation for which he is responsible. If the alteration is insisted upon, the contractor is to be freed from the consequences. Should the alterations involve the abandonment of work already done, a reasonable sum is to be allowed.

Negligence on the part of the contractor is then dealt with, and power is given to the purchaser to get the work done by other parties at the expense of the contractor. This is followed by the procedure to be followed in the event of the death or bankruptcy of the contractor.

The important subject of inspecting and testing is next dealt with. The engineer must give seven days' notice of his reasons for rejecting the plant or materials; he must inspect or test work within seven days of being advised that it is ready. The conditions are given upon which tests at the makers' works, or on site, are to be carried out.

If there is undue delay in accepting delivery of the plant, the purchaser is to be held responsible not only for storage and insurance, but is to make payments as though the plant had been delivered, allowance being made for the cost of carriage to site and erection.

The contractor is not to overload a crane of which he has the temporary use. The use of tools brought to the site by the contractor, the liability of the contractor for all measurements on site, and the obligation of the contractor to keep a competent representative on the site, are dealt with, and there follow a number of paragraphs dealing with the liability of the contractor for accidents, damage, and insurance against fire. Defective work on site condemned by the engineer is to be altered.

In the important matter of payments, instalments up to 80 per cent. of the work done are to be paid during the progress of the work, half the balance, *i.e.*, a further 10 per cent., one month after acceptance, and the balance 12 months later. The retention periods are a little longer than in the old conditions.

An important point is that the existence of minor defects is not to hold up payments, but in calculating the amounts payable allowance is to be made for the cost of rectifying such defects.

The vexed question of the disposal of provisional sums is decided by giving the engineer the right to allocate or appoint sub-contractors for certain defined parts of the work. These sub-contractors are to be paid by the contractors, who shall have the right to charge 10 per cent. profit on all sums so disbursed.

The next clauses deal with the issue of certificates by the engineer as they fall due, the reservation that the issue of the engineer's certificates does not affect the purchaser's legal rights, and the obligation on the part of the engineer to grant extensions of time for certain specified causes which are admitted to be out of the power of the contractor. The amount of damages to be payable by the contractor in the case of late completion is left blank, and in this there is another difference from the last draft.

There is a considerable amount of attention given to the question of the tests on completion, the right to make beneficial use of the plant before the tests, the time of taking over, and the rejection of plant which does not comply with the guarantees. If the purchaser decides to purchase other plant, he must do this under competitive conditions within a reasonable time, and the contractor's full and extreme liability is to be the payment or refunding to the purchaser of such competitive cost. If the plant is not so replaced within a reasonable time, it is to be returned to the contractor, who shall refund all moneys paid in respect of it, and any claim for damages made by the purchasers shall not exceed 25 per cent. of the value of the plant. Should the purchaser after rejection make beneficial use of the plant, a reasonable allowance is to be made for such use.

The liability of the contractor during the maintenance period next receives attention; this is followed by an injunction to the contractor that all local by-laws and regulations are to be observed, and, finally, there is the arbitration clause. This is very comprehensive and fair to both sides. Any dispute may be taken to arbitration before an arbitrator to be appointed by the President of the Institution of Electrical Engineers, whose decisions and award of costs shall be final.

A note attached to the general conditions stipulates that in the advertisement inviting tenders, a place shall be specified where contracting firms may be able to see the specification and drawings without payment. This is a very useful suggestion, as it enables firms to see whether they are in a position to tender or not.

From the foregoing it will be seen that on the whole the present issue meets all reasonable requirements, and we anticipate that for a very long time these will be treated as the usual standard conditions on which electrical contracting work is carried out.

Lead.

The position of the lead market has again been very puzzling, the alternations of firmness and ease proving problems which are exceedingly difficult of solution upon visible grounds. At the back, however, hovers the Mexico trouble, which has introduced unexpected and incalculable factors, and the possibility is that although the shortage of supplies from this important source is not reflected in the import returns so far as the United Kingdom is concerned, it may yet play a part though not an apparent one in connection with requirements on the Continent. Some such theory seems required to account for the price of the metal to-day. The imports of lead into the United Kingdom for the first four months of this year amounted to 77,265 tons, which compares with 73,507 tons in 1913, which total records an increase of nearly 4,000 tons in spite of the practical cessation of shipments from Mexico. The extent to which Mexican output has been cut off, is shown by the fact that the British imports from that country from June, 1913, till the end of April, 1914, amounted to only 2,210 tons, while for January to June last year the total was nearly 6,000 tons. This shutting off of Mexican lead has also affected the production of the United States refineries, and accordingly the British imports from the United States for the first four months this year, were 5,700 tons, against 9,000 tons in 1913, but it is very significant of the poor state of American trade that this year the United States should have actually shipped domestic lead to Europe. Hitherto the United States exports have been limited to lead refined in bond from Mexican bullion, but what with tariff alterations and the dullness of home trade, Missouri producers this year sold domestic lead to Europe, while there has also been some selling of the usual metal recovered from imported raw material. With the spurt in prices seen recently, further sales were just on the eve of being effected and the business was only prevented by a sudden sharp drop in the London market. Business, however, seems possible again now. This all goes to show that America is still keeping a very watchful eye upon the position on this side of the Atlantic, and the movements in the London market, therefore, become still more difficult to explain. On merits, and from all outward indications, it would reasonably be assumed that lead was too high at anything round £19 a ton for current month contracts of soft foreign material, but there are days when the market wears a very strong appearance, for which, as has been said, it is difficult to account. Possibly the bear account is still being covered up. This has certainly been considerably larger than had been thought, and there is a very natural inclination to make the most of opportunities which are put in the way of holders, but this hardly seems to meet the case, and, for the time being, the entire market position is exceedingly difficult to read. There is, however, no doubt that the United States stocks of lead have within recent months been very materially reduced, for not only were substantial quantities shipped to Europe, but there was a very considerable tonnage disposed of to the Canadian market. The market is affected by local conditions which have temporarily set it above the usual current of trade affairs, and it thus stands in an exceptional position. Taking a moderately long view, however, there is no reason why lead should not come into line with other commodities, and a reasonable line to take is that to-day's prices are at least sufficiently high on the general trade and industrial situation.

The I.E.E. and the Industry.

In view of recent proceedings of the Council of the Institution, it may be of interest to consider some points which have a bearing upon the question of its relationship with the electrical industry. In the first place, the view is sometimes advanced that the Institution is prevented by its Memorandum of Association from dealing with matters other than scientific and technical. As a matter of fact, however, the Memorandum confers upon the Institution the widest powers that could be desired. The objects for which the Institution was established are stated

by Clause 3 (B) to be, *inter alia*, "to promote the general advancement of electrical and telegraphic science *and its applications*," and after detailing, in addition to holding meetings, the promotion of exhibitions of apparatus, and the publication of any papers or other works on the said science *or its applications, or subjects connected therewith*, and the provision of grants of money for the purpose of promoting invention and research in the science *or its applications or in subjects connected therewith*, the same Clause in Sec. (D) broadly authorises the Institution "to do *all such other lawful things* as are incidental or conducive to the attainment of the above objects." (The italics are ours.) What further powers could be needed? It will be noted in particular that "the applications of electrical science, and subjects connected therewith," are specifically and repeatedly included within the scope of the Institution's activities. The objection on this score is absolutely baseless. If it had possessed any solid basis, we should have heard of it when the broader policy was enunciated by the President, and accepted by the Council, of the Institution.

That it was accepted by the Council is not disputed. Members of Council followed the then president, Dr. Ferranti, in debate, backing him up; members of Council accompanied him on a tour of the Local Sections, in support of the new Articles, which were avowedly intended to facilitate the admission of leaders in the commercial sphere to the counsels of the Institution, and to furnish the funds needed to carry out the Broader Policy. At the general meeting on November 2nd, 1911, the President said that the only body that could really represent electrical interests was that Institution, which should, therefore, put itself into such a form that it could be really useful to the interests of all concerned in electrical work. Therefore, it was desirable not to limit the membership to purely technical people; they wanted to bring in many able men who were not purely electrical engineers, and to get them to help in conducting this business. Mr. Hammond said they could now carry out various new developments, open an employment bureau, and supply technical and commercial information to individual members, and spoke of their desire to enlarge the scope of the Institution. At the meeting on November 16th Mr. J. F. C. Snell approved of the "broader and better policy." Mr. J. E. Kingsbury said they had extended their outlook; they had a greater perception of what the Institution was, and what it could be, and he referred to the wider scope of the Institution, which was "so obviously necessary." Mr. Hugo Hirst supported the Council's proposals, and of the 17 speakers, only one opposed the broader basis. But there is no need to labour the point: two years ago the Institution had set its face in a new direction; now the Council is turning its back upon the promises it then made.

Commenting on the fate of the Industrial Committee, which is the subject of its leader of last week, the *Electrician* supports the policy of the Council, with an "inspiration" worthy of a better cause, putting forward highly improbable hypothetical cases in which the interests of different sections of the Institution would be diametrically opposed—if such cases could arise. We cannot refrain from smiling at the confiding disposition of our contemporary, which meekly welcomes the Council's determination to take such action in future, *as in the past*, as may be to the general advancement of electricity and its applications, &c.

Our contemporary proceeds to find fault with the views expressed in our leader of May 22nd, but in so conjectural and half-hearted a manner as to give us the impression that the writer would much rather have endorsed our remarks. Indeed, towards the end the tone of the article is strongly in favour of action on the part of the Council in industrial matters, and it concludes with an expression of regret that the Council did not indicate its intention of appointing a new Committee to deal with such matters; so that, after discounting for the obvious inspiration of the earlier comments, we feel justified in claiming that our contemporary in reality agrees with us. Seeing that with the rest of the technical Press it welcomed the forward policy of the Council in 1911, it could not have given its unqualified support to the reactionary tendency at present exhibited without incurring the same reproach for inconsistency as the Council itself.

10,000 MILES FROM BRITAIN.

Some Notes on the Arrival of Machines Exported.

By PROF. C. A. MIDDLETON SMITH, M.Sc.

During the past twelve months about 500 cases and packages of machinery and engineering and scientific appliances have arrived in the British University of Hongkong. The following reflections concerning the way in which different firms arrange their export work are made in the hope that readers of this journal may obtain some slight benefit from the experiences related.

It is, of course, with great diffidence that the writer records his impressions of the way in which British engineers manage their business; because, first of all, all the apparatus sent out to us in Hongkong has been, to use a Chinese expression, "Cumshaw" (which means "a gift"), and it is obviously hardly fair to criticise those friends who have come forward so splendidly in answer to the appeal to maintain British engineering prestige in the Far East, and also because the writer is no business man but merely has an academic position. No names are mentioned, and it will be fully understood that these lines are merely sent for the benefit of the electrical and allied trades, and in no way with any idea of hurting the feelings of those who may recognise a criticism of some of their own methods, but to whom all Britishers in China are grateful for their help in equipping our showroom laboratories.

Advice Concerning Shipments.

In our particular case we were fortunate enough to have as hon. shipping agents Messrs. Matheson & Co., 3, Lombard Street, E.C. This firm has probably had more experience of shipping goods to the Orient than any other house in Britain. Their associates in Hongkong are Messrs. Jardine, Matheson & Co., Ltd., and they have throughout arranged all deliveries. Their usual procedure has been to advise us a few days before the delivery of the goods that a certain vessel will be due on such and such a date. To give an actual example: "We have been advised of the following shipments, viz.:—per s.s. 'Oanfa,' expected here on the 19th instant, 5 cases electrical machinery from the British Westinghouse Electric and Manufacturing Co., Ltd." We have not handled the bills of lading, nor have we arranged with local contractors for coolie hire. Our local friends have done all of that class of work, while we have been engaged in checking over contents of cases, unpacking the same, erecting the machinery, and communicating with our numerous friends in Britain concerning various details of our work. At the same time regular instruction has gone forward, and all of the sixty engineering students have received their full course of laboratory classes and lectures. New buildings are already being erected for a machine shop and an hydraulic laboratory, and these plans, etc., have been prepared by our own staff, for every effort has been made to economise the very limited funds at our disposal.

Apparently what has always happened with regard to shipments is that manufacturers have communicated with our hon. shipping agents, who have, in turn, advised them as to which particular ship and port they must send the goods to. In most cases the manufacturer has also advised us as follows: "We beg to inform you that, as instructed by Messrs. Matheson & Co., we have this day despatched per Birkenhead for freight by the s.s. 'Achilles' the engine presented by us to the University of Hongkong," and so on. But in some cases we received no such notice. Probably our friends thought the shipping agents would advise us by post, and in all cases we had advice a few days before delivery. But when goods are being sent 10,000 miles the sender

should not be afraid of supplying too much information, and a line to the person to whom the goods are consigned is advisable.

Concerning Drawings.

Some of our friends sent us detailed drawings almost as soon as they promised to send out the machine, and that was generally a great advantage. It enabled us to prepare foundations. In one case it was a disadvantage—because the drawing was wrong. As a result of the mistake by the draughtsman we had the felicity of chipping out about twelve cubic feet of solid concrete. And we had been at such pains to make that concrete as hard as possible!

In another case the machine had various parts and there were several foundations. We received a drawing which was all that we desired, and, best of all, it came out some weeks before the machine was shipped. All piping was coming out with the apparatus. We set to work on the foundations and felt quite sanguine that we could have the machine running within a week of its arrival in the Colony. We should have done so, but the lengths of the delivered piping were quite different to the lengths shown in the drawing. "Only a small matter," says the man at home who is used to erecting; but things are different in the Far East. Hongkong is very advanced, as compared to China proper, but it was difficult to screw the pipes, etc., even in this Colony. The job was delayed. If it had been in Canton or in the interior the foundations must have been scrapped. Most probable—the whole of the apparatus would have been allowed to fall into disuse. The home firm would, in the mind of the Celestial, have been guilty of a breach of faith. There are thousands of pounds' worth of machinery which have been delivered to the Chinese and have never been at work because the Celestial cannot fit them together. The Orient is not London, and the Easterner hates to "lose face" by asking questions. He informs his superior that there has been fraud, *not* that he is ignorant of what is wrong.

The Complete Outfit.

Another most irritating thing to happen is for only part of a machine to arrive. We badly needed a lathe, and great was our delight when our shippers said they were delivering the first of the half-a-dozen lathes promised by different makers. It duly arrived, but there was no face plate and no chuck. Our alert Chinese mechanic immediately remarked upon this: "I talkee one man Canton-side, he belong my velly good fiend, he wanchee me catchee one piecee lathe. My talkee he more better my catchee one piecee Jones lathe allee same come England-side. He say, can do. My catchee one piecee lathe allee same Tai Hoc Ton" (University) "no man can work. He belong velly sorry. He plenty bobbery my." In other words, our Chinese friend would say that he bought a lathe, but only a part of a lathe was delivered.

The same sort of thing has happened, to the writer's knowledge, concerning small generating plants. The dynamo has been delivered with no shunt resistance, or the engine with no oil tank. The sort of complete outfit that deserves all possible praise in a country like this is the "Lister-Bruston" automatic lighting plant, presented by Messrs. R. A. Lister and Co., Ltd., Dursley, England. There are good working drawings, instructions for erecting, starting, and working, and the whole outfit is no sooner unpacked than it is erected.

Concerning Packing.

It has been most interesting to notice the way in which different firms manage a not altogether unimportant portion of their business—the packing of goods. In this matter the electrical firms have been splendid. They use tin-lined cases, and do not stint wood. In one case, sad to say, the tin lining was all right, but damp straw was used, and the result was most unfortunate for us.

Terminal boxes seem to be the fragile parts of electrical machines. We have had three delivered broken, but no other troubles in connection with electrical gear. In other branches of engineering work we noticed that makers did not always assemble the machine before export. On the whole the packing was extremely good, but machinery makers must realise that cases are very severely handled, and unless strongly made they will be damaged.

It is an advantage for the receiver of goods to be able to identify, easily, the packing cases sent to him. We give the prize for packing to Messrs. Archdale, Ltd., of Birmingham, who sent out a large radial drill, and a motor, kindly supplied by Electromotors, Ltd. The case was strong, the machine was bolted and wedged, the motor was inside a box built inside the case, and, in addition to the usual shipping marks, there was painted in bold letters on the case "From ———." We had no doubt as to the contents of that case, and we placed it in the most convenient position for unpacking before the twenty odd Chinese coolies who hauled it up the 300 ft. above sea level had departed.

British Consulting Engineers.

One of the lessons which we are doing our utmost to drive home to the visitors and students here is perhaps worth mentioning. It is that, for any big engineering scheme in China to succeed, there must be someone in Britain (for that is the country we in this colony are concerned with) whose duty it is to inspect the machinery and pass it, from the manufacturer, as suitable for its work. That is an advantage also for the manufacturer. Our progressive friends in Shanghai, who have done so admirably in the matter of electricity supply, have this arrangement, and, of course, it pays them. British engineers throughout China should endeavour to persuade our Chinese friends to adopt this system. The University has great reason to be grateful to its Hon. Consulting Engineers in London.

There is in China a vicious idea that it is possible to save pennyworths of tar in engineering work, and that is entirely due to the ignorance of applied science which exists in this part of the world. The success of German firms is, to some extent, due to their accommodation in this respect. It is a pleasure to record that, already, we find the students in this University are beginning to appreciate that shoddy goods are not the cheapest, but that if you want a good article you must pay for it. In the tropics it pays to have good electrical apparatus.

Finally, a word about catalogues. It is advisable to give prices. You may cover yourself with all sorts of phrases such as "Subject to discounts," or "Subject to no increase in the price of labour or raw material," but it is most difficult to persuade the Oriental to look at a proposition until he has some sort of an idea as to the price of the outfit.

These few notes are put together in the hope that they will be of value to exporters, but they would be incomplete without a passing reference to the fact that all Britishers in the Far East admire greatly the efforts which have been made during the past two years by British manufacturers to regain our national prestige for enterprise in the Orient. We, in Hongkong, believe that there will be a great deal of trade in the near future, and beyond all else we want the home country to have a full share of it.

Fire Prevention.—The International Fire Service Council is holding an Executive meeting in London on June 15th, 16th and 17th, at the invitation of the British Fire Prevention Committee, when the principal items under consideration will include the preparation of an International Fire Dictionary, *i.e.*, a dictionary of fire-technical terms in three languages, and the arrangements for a conference on certain fire-service and fire-preventive subjects to be held at Copenhagen in 1915.

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THE RATING OF PUBLIC UTILITIES AND THE BUDGET.

By JOS. J. H. STANSFIELD.

Until recent years the provisions of the Budget were usually completely carried out by means of a Finance or Revenue Bill, and though persons connected with public utility undertakings were concerned as taxpayers, general rather than financial legislation dealt with those proposals of the Government of the day which would particularly affect undertakings of this nature.

The financial basis of social legislation is, however, becoming increasingly recognised. Whether the individual may consider this to be for better or for worse, present methods cannot be ignored, and the object of this article is to draw attention to the proposals of the Chancellor of the Exchequer in so far as they relate to the electrical industry in connection with the levying of rates for local purposes on site values, and the suggestions hinted at with respect to new legislation for the revaluation of rateable property.

The requirements of spending authorities are constantly increasing, partly through local needs and partly in consequence of obligations placed upon local authorities by Parliament. It has often been pointed out that many of these obligations are of a national rather than a local character, and the Government in the Budget of this year have recognised this by promising increased subsidies in part payment of such services, and indicated that further assistance will be given by means of legislation enabling local authorities to levy rates on site values.

The laws of rating still in force outside the Metropolis in the greater part of England and Wales are of long standing. After the dissolution of the monasteries in the reign of Henry VIII. in 1535-6 and 1539 and in acts passed up to the year 1597, the parish was recognised as a suitable area for the collection and expenditure of monies received from persons charitably disposed.

At first such payments were voluntary, but it was gradually considered to be necessary to apply compulsion, and in 1552 the Bishop was authorised to put pressure upon the parishioners, until in 1601, in the reign of Queen Elizabeth, this duty was delegated to overseers of parishes by an act which is still in force, and though amending acts have since been placed on the Statute Roll, the important principles laid down in that act of assessing the rateable value separately for each parish and rating the occupier only, still form the basis of modern law and practice.

The act of Elizabeth stated that "the occupiers of lands, houses, tithes impropriate or propriations of tithes, coal mines, and saleable underwoods should be liable to be rated for the relief of the poor." Since the passing of that act very few additional classes of property have been made expressly assessable for local rating purposes, whilst on the other hand a very large class, stock in trade, etc., have been directly exempted.

The term "lands" and "houses" now have a far wider application than they had 300 years ago, and have been extended to classes of property which were not and could not at that time be in contemplation because of their non-existence, such as warehouses, sheds, and manufactories containing machinery, and public utility services in the hands of local authorities and companies, such as railways, tramways, light railways, gas works, electrical, water and other works of an analogous nature which have come and are coming into existence from year to year in increasing numbers.

For many years the incidence of rating was very unequal, until in 1836 an act was passed which provided that the standard by which the value of property for rating purposes should be determined should be "an estimate of the net annual value of the several hereditaments rated thereunto; that is to say of the rent at which the same might reasonably be expected to let from year to year free of all usual tenants' rates and taxes, and tithe commutations, rent charge, if any, and deducting therefrom the probable average annual cost of the repairs, insurance and other expenses, if any, necessary to maintain them in a state to command such rent."

The estimated rental value and not the actual rent paid was thereby fixed as the basis of assessment, but where property is rented, or where it can be compared with rented property the rent paid is usually taken as the gross assessment, the rateable value being arrived at by deducting a percentage varying with the class of property, the actual percentage varying somewhat with different Assessment Committees.

This method is obviously not applicable in the case of many classes of rateable hereditaments such as railways, tramways, and electricity undertakings, because such property is not rented nor comparable with similar property in the parish, a further difficulty arising in consequence of many of such undertakings extending to other parishes and often being situated in the areas of different Assessment Committees.

As the unit area of rating is the parish, it necessarily follows that the assessment of undertakings of this kind is complicated, and unless there is a serious legal principle involved, it is often not worth while proceeding to an appeal, as the costs that are likely to be incurred may be such that it will take many years of reduced rates in the parish to recoup them even if the appeal be successful. In 1869 an act was passed dealing with the rating of property in the Metropolis, but the difficulties of laying down a specific method of arriving at the assessments of rateable hereditaments, such as we are considering, were found to be so great that they are in London, as in the Provinces, still determined "according to the circumstances and the general principles of law."

It is not the purpose of this article to explain in detail the method of valuation applied to public utility undertakings, but the underlying principles may be generally stated. The gross profits are first ascertained by deducting the expenditure from the receipts, both these being subject to certain deductions as a result of many legal decisions. From the gross profits a percentage on tenants' chattels is deducted together with a further sum representing the amount which would have to be set aside to replace the capital expenditure at the end of their assumed life, the balance being the net rateable value of the undertaking.

Considerable capital expenditure must usually be incurred before such undertakings can be made to pay, and the proportion of standing charges are often such that several years must pass before the method of valuation shows a net rateable value for assessment. The basis of the assessment is the rentable value, and it is obvious that a tenant from year to year could not afford to pay any rent if the future prospects of the undertaking were eliminated, a fact which is usually recognised by assessment committees, the assessments made being frequently small and in the nature of an acknowledgment.

The defects in the method of valuation have been recognised for a number of years, and in 1897 a Royal Commission was appointed to enquire into the present system under which taxation is laid for local purposes, the Commissioners being directed to report whether all kinds of real and personal property contributed equally to such taxation, and if not what alterations in the law were desirable in order to secure that result.

Various attempts have been made by the Legislature to remedy these defects, the Valuation

(Metropolis) Act having met these to a certain extent, so far as London is concerned, by securing one valuation as the basis for both Imperial and Local taxation, by a revaluation of all properties once every five years with power of revision during the intermediate period, by fixing a scale of maximum deductions for certain classes of property and by the furnishing of returns similar to those obtained under the Income Tax Acts from owners and occupiers, and the extension of this act has been frequently recommended to other parts of the country.

The first report of the Commissioners was issued in 1899, in which will be found details of several bills introduced for establishing one uniform mode of rating, and after consideration of these and the hearing of expert evidence, recommendations were made which will doubtless be carefully considered before a new Valuation Act is introduced.

The principal suggestions are those contained in the Valuation (Metropolis) Act, and also that there should be one valuation authority in each county (and, if so desired, in each county borough) and that their valuation lists should be the basis on which rates and taxes for all purposes should be raised. These areas would be divided into convenient districts with representative committees, assisted where possible by professional surveyors, notice being given to the ratepayers when it was proposed to increase any valuation or include one for the first time.

Special properties such as railways, canals, mines, tramways, docks, telephones, and gas, water and electric light works are to be valued in the first instance by a valuer appointed by the valuation authority, objections being heard by that authority and appeals lying to the railway commissioners or a special tribunal created for that purpose. It is not mentioned, but doubtless some further arrangement would be necessary to deal with undertakings that are in the area of more than one Valuation Authority.

In the final report, issued in 1901, recommendations are made with respect to the rating of land values either by placing thereon a separate or additional burden, it being stated that it could not be contended that land on which buildings are erected escaped taxation under the present system.

The proposals of the Government should be carefully considered on behalf of the electrical industry by institutions and other representatives of that industry, special attention being given to general exemptions from rateability already granted to analogous undertakings.

The rating of such classes of property should bear some relation to the advantages conferred. Parks, libraries, town halls and the like in parishes situate away from the principal offices and works, are of little benefit to the owners of tramways, light railways and electricity undertakings. This has already been recognised in the case of railways, and in Scotland under the provisions of the Poor Law (Scotland) Act 1845, railways and tramways (excluding stations, depôts and buildings), and the underground pipes of gas and water companies, are in burghs to be valued for rating purposes at one-fourth the gross valuation, this system being considered to be in the words of the late Sir John Skelton as "a rough method of adjusting the assessment to the taxable capacity of the ratepayer," a system which appears to have grown out of the original endeavour to tax on means and substance, and indicates an effort to grant to those occupiers whose rentable value may be considered higher in proportion to their income a proportionate relief.

In this question of partial exemption of rateability the interests of railway companies, and the owners of tramways, light railways, water, gas and electricity undertakings are practically identical, and should the necessity arise it would doubtless be of assistance if means were devised to combine forces in order to bring such pressure to bear upon the powers that be as would adequately protect their interests. As a matter for consideration, a joint committee of representatives of the Railway Clearing House, the Light Railways and Tramways Association, the Institution of Electrical Engineers, the Incorporated Association of Power Companies, and the Incorporated Municipal Electrical Association is suggested, the committee to co-opt such expert assistance as they may consider best.

Until concrete proposals are made there must be an open mind, for whilst no one can reasonably object to public utility undertakings bearing their fair share in local burdens, any attempt to impose an unfair basis of rating which would retard the progress of such quasi-public industries should be strenuously resisted.

WASTING OF THE VERTICAL PIPES OF FUEL ECONOMISERS.

By EDWARD INGHAM, A.M.I.Mech.E.

In the working of fuel economisers of the Green type, the most prolific source of deterioration is probably wasting of the cast iron pipes, which takes place both internally and externally.

Unfortunately, as everybody who has had any practical experience of the working of this plant knows, it is a most difficult matter to make a satisfactory examination of the pipes. In fact, all that can usually be done to make an internal examination is to pass a light down the pipes, and by means of this try to discover any signs of wasting. As regards external examination, only the outer tubes can be thoroughly examined, but in view of the fact that the outer tubes at the cold end, *i.e.*, the inlet end, generally suffer the most severely, the condition of the inner tubes is a matter of secondary importance in the majority of cases.

With regard to internal corrosion, much of course depends upon the nature of the feed water. A water which contains corrosive ingredients will naturally give rise to more or less serious wasting. Internal wasting of fuel economiser pipes, however, is not always due to the use of a corrosive water. It is not very uncommon to find severe wasting even where the water used is exceptionally good, such as for instance the water from Loch Katrine, in Scotland, which supplies Glasgow. The wasting which results from the use of good water is of a very peculiar form, because the surface of the metal of the pipes remains apparently unchanged, but on applying a chisel, the wasted material, which takes the form of blacklead, may be easily pared off. It will be obvious that this form of corrosion is more or less dangerous, because there is no apparent reduction in the thickness of the metal, and the defect is thus very liable to escape detection. A number of failures of economisers have occurred owing to the wasting having been overlooked.

The defect alluded to is known as "graphitic" wasting, and in making examinations of economisers, it is always advisable to keep a sharp look-out for this form of wasting, particularly where the feed water used is comparatively pure. When the feed water contains much scale-forming matter in solution (such as the salts of lime and magnesia), the economiser pipes gradually become coated with scale which serves to protect the internal surface of the pipes from "graphitic" wasting, and hence it is that where hard waters are used, the trouble is not likely to be met with. With soft waters, no such protective coating is formed, and hence, it is usually only in connection with such waters that the trouble is experienced.

"Graphitic" wasting occasionally proceeds with great rapidity. In the "Journal of the Society of Chemical Industry," 29 (1910) 1141, Steel reports a case where the cast iron pipes of a Green's Economiser were dissolved away within a few months, only a thin outer shell remaining. About 84.5 per cent. of the iron and the whole of the combined carbon and silicon had disappeared, and a residue remained in the pipes containing the whole of the graphite, phosphorus, and silicon, the latter as oxides which formed a thick layer of plumbago-like material on the inside of the pipes. The water used in this case was the town water of Sydney, N.S.W., which is very soft in character.

Although cases of "graphitic" wasting are not very uncommon, the usual cause of internal wasting of economiser pipes is due to the presence of acids in the feed water. Where the feed contains such acids it should be treated with suitable reagents which will neutralise the acidity and at the same time cause precipitation of any scale-forming matter contained in the water. The reagents required can only be correctly determined from a chemical analysis of the water.

Whilst internal corrosion of economiser pipes is frequently difficult to prevent, the same can scarcely be said of external corrosion. The latter is generally the result of damp or moisture in contact with the external surfaces of the pipes, and if proper care be taken to keep the surfaces dry, the trouble is not likely to be experienced to any serious extent.

It has already been pointed out that the outer pipes at the cold or inlet end of the economiser are the pipes most liable to suffer from external wasting, and the wasting of these pipes is usually brought about in the following manner. The waste gases, or products of combustion, coming from the boilers contain a certain amount of steam, which, when it comes in contact with the economiser pipes at the cold end tends to become condensed and settles on the pipes, thus setting up external corrosion. When the coal used in the boiler furnaces contains much sulphur, the products of combustion will probably contain sulphur dioxide or sulphur tri-oxide, in addition to steam. These gases, in combination with water, form sulphurous and sulphuric acids, which have a powerfully corrosive action on iron. Hence it is very important that condensation of the steam in the waste gases should be prevented as far as possible if serious wasting is to be prevented. To attain this end, the feed water should not be allowed to enter the economiser at a lower temperature than 90 or 100 degrees Fah. If the condensed steam from a condensing engine be used for feeding the boilers, or if the feed be passed through a feed water-heater before going to the economiser, the temperature of the water when it reaches the economiser will be well above 100 degrees, so that trouble is not likely to be experienced.

In other cases, however, the water will be cold, and some means should therefore be adopted for raising the water to the desired temperature. A convenient method of doing this is to connect, by means of small wrought iron piping, the delivery pipe of the economiser with the suction pipe of the feed pump. By means of such connection some of the heated water leaving the economiser may be mixed with the cold water going to the feed pump. A small valve placed on the wrought iron pipe connection will enable the engineer-in-charge to regulate the amount of hot water passing into the cold feed so as to raise the temperature of the latter to what is required for preventing condensation of the steam in the waste gases. Generally speaking, a temperature of 100 degrees will be found sufficient to prevent condensation, but in some instances trouble has been met with even when the temperature has been as much as 120 degrees.

External wasting, not only of the pipes, but of the economiser generally, frequently results through allowing the brickwork setting to become damp. Brickwork is porous and readily absorbs moisture, and hence special care should be taken to prevent drainage or waste water from the valves, etc., from soaking into the setting. Care should also be taken to prevent water draining into the soot chambers, as otherwise severe wasting of the bottom boxes and the lower portions of the vertical pipes is liable to be set up. Some soot chambers are naturally damp, in which case it is not an easy matter to prevent external wasting. If, for instance, the soot chamber is below the level of the drains, any water which collects in it cannot be drained off. Under such circumstances it may be advisable to dig a well in the vicinity, and to provide suitable arrangements for draining the water which collects in the soot chamber into the well. It will, of course, be necessary to empty the well of its water from time to time.

Owing to the fact that economiser pipes are liable to become thinned and weakened both internally and externally, it is most important that their condition be carefully observed, as far as possible, from time to time. It is a great mistake to suppose, as many do, that owing to their small diameter and great thickness, there is very little likelihood of the pipes failing, and further, that even should failure occur, the results can only be of a mild character. It is quite true that an economiser pipe is capable of withstanding an enormous pressure so long as it remains of its original thickness, but it will be obvious from what has been said that the thickness of metal may become gradually reduced to such an extent owing to either internal or external wasting, or to both combined, that it is eventually quite unfit for sustaining the pressure to which it is exposed. Further, it should not be forgotten that the pipes are liable to be weakened by overheating, and when in addition to this, the fact that the pipes may have been cast eccentrically so that one part is much thinner than the other, due to shifting of the core, is taken into account, it will be seen that failure is not by any means to be regarded as impossible. A reference to some of the reports on boiler explosions which are issued from time to time by the Marine Department of the Board of Trade will provide abundant evidence of the fact that failures do frequently occur. With regard to the belief that even should failure of a pipe occur, the results can only be of a mild character, this possibly arises from the fact that an economiser is only intended to be exposed to water pressure, and as water is practically incompressible, there is no great expansive force to be relieved in the event of failure occurring. The belief is no doubt strengthened by the fact that vessels and structures which have to be exposed to internal fluid pressure are invariably tested by hydraulic pressure, because no great harm is done should any part fail under the test. With an economiser, however, the case is very different. The water in the economiser, or at least a portion of it, is usually at a temperature considerably greater than 212 degrees (the temperature of boiling water at atmospheric pressure). Hence, should a pipe fail, the escaping water would immediately flash into steam, the accompanying violent expansive force of which might easily cause other pipes to explode, until, eventually, the whole economiser was shattered. In the case of a vessel being tested by cold water, if any part fails, the pressure is instantly relieved, with very little increase in the volume of the fluid, and with no expansive violence therefore, and thus little harm is done. That fuel economisers can and do explode with disastrous results is proved by the explosion which occurred at a tin works in South Wales not very long ago, when one section (96 pipes) of an economiser of 192 pipes was so completely shattered that it could not be re-assembled.

In order to ascertain the internal condition of the pipes, a lighted candle or a small electric glow lamp

should be dropped down the pipes and a visual examination, as far as practicable, then made. Should any internal wasting be discovered, the depth of which is uncertain, the best plan is to withdraw a pipe here and there, and either to drill or break up the pipes so drawn, so that the actual thickness of metal remaining may be correctly ascertained and a general idea of the internal condition of the pipes thus be obtained. Drilling, it may be mentioned, is not so reliable as breaking up the pipes. The extent to which external wasting has taken place is, of course, easily ascertained by calipering the outside diameter, and comparing this with the original diameter.

Whilst withdrawing and breaking up defective or corroded pipes is the only really satisfactory method of ascertaining their true condition, this procedure is a troublesome and an expensive one, and consequently hydraulic testing is frequently resorted to as a substitute for visual inspection. The hydraulic test, if carried out under the supervision of an expert, is certainly of great value in discovering seriously wasted or fractured pipes, but it cannot be regarded as an infallible test. By some it is believed that hydraulic testing to a pressure of from one and a half to twice the safety valve load is distinctly harmful, because serious defects may be aggravated without their existence being revealed. Indeed, cases are not wanting to show that failure of boilers and similar vessels has occurred very shortly after hydraulic testing, with a pressure of little more than half that of the test load. A vessel under steam is a very different structure from one under water pressure. In the former case, the racking strains resulting through differences of expansion in different parts of the structure are brought into play, whilst in the latter case no such strains exist, the whole of the structure being exposed to one constant temperature. Hence hydraulic testing cannot be regarded as absolutely reliable.

In the case of the explosion in South Wales already referred to, the economiser had been hydraulically tested to about twice the working pressure only a few months previously, and had shown no sign of weakness.

Notwithstanding, however, the possibility of more harm than good resulting from the application of the hydraulic test, it will generally be found that such means of testing economisers is extremely valuable if carried out with care and under proper supervision. Weakened and fractured pipes are constantly being discovered in this way, which pipes would no doubt have sooner or later led to an explosion had the test not been applied.

When hydraulic testing is resorted to, it is important that the pressure applied should be maintained for some time, not less than twenty minutes or half an hour, because experience has shown that the weakened parts usually fail after the pressure has been on for some time.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Picking up Telegrams with a Pipe.

So much is heard, when wireless telegraphy is under discussion, of the secrecy of cable telegraphy that the following account of a little experiment with a surprising result may be of interest.

The writer is in charge of an engine-room built at a spot close to where a telegraph cable leaves the island of Guernsey for the shores of England. Overhead wires from the cable hut pass within 5 ft. of this building, and in the course of experiments the writer found that by connecting a telephone receiver to any part of an engine and putting the other terminal to earth the Morse code signals passing along the telegraph wires became audible.

Incoming messages from England were too attenuated to be read, and outgoing messages sent automatically were too rapid, but hand-transmitted messages from the local post office it was possible to pick up.

As a matter of fact, the experiment was discontinued so soon as one message to London had been read, which merely announced the sailing of a ship from the nearest harbour, which a few minutes later was seen sailing outwards.

An iron air pipe in connection with the engine, running for 20 ft. beneath the roof of the engine room, parallel with the wires outside, and then dropping to earth, appears to be the means by which messages can be inductively received.

The experiment seems to be of interest as showing the eavesdropping that might possibly be carried on in secrecy within a building with no outside connections whatever, and this seems to the writer to form another argument in favour of armoured underground cables for all important land lines.

Edwin O. Catford.

Review of "Electrical Meters."

Referring to the letter from Messrs. Everett, Edgcumbe and Co., Ltd., in your issue of April 24th, concerning the inkless type of graphic instrument, may I be permitted to point out that recording instruments of the kind referred to, which make a dot once every five seconds or so on the chart, instead of a continuous trace, are not suited for use on rapidly-fluctuating loads such as traction loads. In such cases large variations of load frequently occur between two successive dots, with the result that the dots are scattered disconnectedly about the chart; no definite curve can be traced, and outlying dots (which are often the most important part of the record, since they represent maximum or minimum readings), may readily escape notice, as they are often a long way from any other dots. Moreover, it is quite a chance whether the dots happen to hit the tops of the peaks and so record the full extent of the fluctuations, while entire peaks may even occur in between two dots, and so escape record altogether.

On the other hand, instruments of this kind are, no doubt, well adapted for use on loads which do not fluctuate too rapidly, and, in fact, may be particularly advantageous for use in cases where the fluctuations are very small, and are hardly sufficient to overcome the pen friction of the more ordinary type of recorder, as, for instance, for recording the voltage of a well-regulated lighting circuit.

I quite appreciate the difficulties due to pen friction, which is, undoubtedly, a serious drawback to the ordinary pen type of recorder. I once saw an ingenious, but simple, device which had been fitted to a recorder, in the shape of an electric bell, the hammer of which tapped on the chart; at every stroke the pen jumped off the paper momentarily, and this seemed to overcome friction effectively, without making the trace too discontinuous. It would be interesting to learn whether any of your readers have had experience of any such device.

Was not a device on a similar principle used long ago by Thomson for overcoming pen friction in his siphon recorder?

G. C. Allingham.

London, N.W., *May 26th*, 1914.

Is Aluminium Diamagnetic?

With reference to the above question, I would refer you to a book entitled "Aluminium, its History, &c." by J. W. Richards, A.C., Ph.D., published in England by Sampson Low, Marston & Co., Ltd. On page 67 the author refers to the magnetic properties of aluminium, and quotes Prof. Frank Very, of the Allegheny Observatory, Allegheny, Pa., who finds "Aluminium with only a trace of iron to be absolutely non-magnetic. With 0·05 per cent. of iron, none could be observed. An ingot containing 1·5 per cent. iron showed faint polarity, while with 2 per cent. the polarity was very decidedly observed."

G. J. Freund.

London, E.C., *May 27th*, 1914.

The Institution and the Electrical Industry.

I read with pleasure the excellent leader on "The Institution and the Electrical Industry" in your issue of the 22nd inst., and it is to be sincerely hoped that it will awaken a genuine interest in the policy of the Institution.

The recent correspondence on the I.E.E. meetings has certainly shown that "there is life in the old dog yet," although the progressive policy so ably introduced during the presidentship of Dr. Ferranti has shown decided symptoms of acute decadence.

To one who has been a student of the Institution for six years, and has taken an interest in the affairs of three of the local sections (including membership of a local students' Committee), it is undeniable that amongst the membership there is a spirit of dissatisfaction of which even an academic or scientific Council cannot be entirely oblivious.

It is not so long ago since there was a great fanfare in Westminster over the increased status of the I.E.E. and the inauguration of the weeding-out process by the institution of examinations, while the subscriptions and entrance fees were raised, as it was pointed out that they were below the average contributed by members of the other great Institutions.

The hopes of many members ran high, for it seemed that at last the Council had wakened up and were going to put their house in order, while there were indications that the Institution would pursue a broader policy and look after the interests of its members engaged in the industrial side of the profession.

The practical results of the Council's policy do not seem to have been eminently successful, for the spirit of dissatisfaction still exists amongst the membership, and the fact that the Institution has failed to look after the interests of its members is proved by the existence of new associations of electrical engineers to deal with matters which properly are the duty of the Institution Council.

The inauguration of an entrance examination has come rather late in the day, and it would be interesting to know how many candidates have passed the Associate Membership examination (and, incidentally, how many of the existing 5,103 corporate members could pass it), for the Council's report states that 112 candidates have been approved for admission to that class on condition that they pass the Institution examination.

It seems only logical that A.M.I.E.E.'s by examination (or under the new regulations) should be distinguished in some way or other, for, personally, I know of many corporate members whose training and qualifications would certainly not satisfy any Students' Committee, and there is little inducement for highly qualified engineers at present to add the mystic letters A.M.I.E.E. to their names. The passing of a written examination is, of course, no criterion of an engineer's abilities, and it is to be hoped that even an academic Council will recognise this fact, for no amount of academic training will compensate for a sound and varied practical experience, coupled with a fair technical knowledge such as can be obtained at, say, an evening technical institute, with classes and teachers registered by the City and Guilds of London Institute.

It would seem necessary that greater discriminative powers be brought to bear by the Council on admission and transfer questions, or that a specially qualified Committee be appointed to deal with such matters, which have a vital bearing on the future of the Institution.

Presumably the contributions of the members were raised so as to bring the membership into line with other engineering bodies, such as the Inst.C.E. and the Inst.Mech.E., but the Associate Member's subscription is now, I believe, actually more than that paid by corporate members of these Institutions, whose status is admittedly higher, and this may account for the decreased membership during the past year. The graduate class does not seem to have been a great success as far as the weeding-out process is concerned, unless, of course, the Council had in view the fact that it was desirable to have a sort of "mixed pickles" class or dumping ground for those whose Studentship had expired, or who for various other reasons could not qualify for corporate membership, and whose subscription would be very welcome from the point of view that it "brought grist to the mill."

The change in the publication of the *Journal*, and its arrival in a state of collapse, hardly seems compatible with the increased status of the Institution (or subscription either!) and in this and other matters the I.E.E. could afford to take a leaf out of the book of its American cousin. There are many other matters which require ventilation amongst the membership, and I sincerely hope that before the new session commences these will have been discussed in the "Correspondence" columns of the Review through the kind permission of the Editors.

Mere Student.

May 27th, 1914.

One cannot help but admire the frank expression of opinion offered by Mr. Wordingham in his article entitled "Should the Council be blamed?" with much of which I heartily agree.

On the other hand, putting aside the fighting propensities which one would naturally expect in the chief electrical engineer of the "first line of defence," surely all history proves, and people are beginning to realise, that "fighting to a finish" does not result in real progress, and certainly tends to impoverish as well as embitter both sides.

It is, I think, perfectly clear that opposing interests require some Authoritative Body to whom they may submit their troubles for reasonable arbitration in order to avoid the very necessity of "furiously fighting." Such an Authoritative Body could not, of course, from the very heterogeneous nature of its membership, adequately advance the commercial interests of any one particular section of its members, because of the natural lack of interest of the members generally in the commercial affairs of this particular section.

The Institution should surely not be out to further the interests of any one section of its members. I would submit, Sir, that the highest interests of the industry would best be served by the Institution fostering and developing good feeling between its various sections by providing the means for ready exchange of views and arbitration when necessary, and also providing a channel whereby the results of scientific research may be presented and widely discussed to the advantage of the industry as a whole.

M.I.E.E.

Frequency Changer.

With reference to Mr. Taylor's letter in to-day's Electrical Review under the above heading, I must thank him for pointing out my error. What I should have said is that the "pulsations" would be halved, which would, on an electric lamp and the like, have the same effect as halving the frequency.

F. W. T.

Comparative Economics of Tramways and Railless Electric Traction.

Mr. Gribble's letter in the Electrical Review of May 29th in its third paragraph gives away the whole of the case on which his I.C.E. paper was based, *i.e.*, that the car he assumed for the purpose has the earning capacity of a tramcar. No assumption that a railless car of equal earning capacity cannot be built was made in the criticism he replies to. If he had assumed such a car in his paper, all the figures of capital cost, weight, current consumption, and most other working expenses would have been different, the results of his comparison would have been different, and the criticism also different.

Mr. Gribble does not apprehend the relation between the maximum carrying and earning capacity of a tramcar and its average earnings per car-mile, perhaps because it has never been his lot to deal with and provide for tramway traffic first hand.

It will be quite easy for him to get a lesson at the cost of a few hours' personal observation. I suggest the L.C.C. service at Blackfriars or Westminster Bridge, about 6 p.m. on a week-day or 1 p.m. on a Saturday.

He will see trains of outward cars, frequently a dozen in succession, marked "Full," *i.e.*, in most cases carrying 78 passengers each; and a similar procession of inward cars, with an average of four to six passengers apiece. Taking both directions, the average occupation of these cars will be somewhere about 40, but it will be clear at once to Mr. Gribble that nothing smaller than the 78-passenger cars can carry the traffic presenting itself, and that even that capacity is insufficient for a considerable period of time. He will appreciate why tramway managers and engineers have, during the last 16 years, advanced from single truck to double-trucked cars, have adopted double decks, have roofed in the upper decks, have increased weights from about 7 tons to 18 tons; that this has not been done for fun, or for megalomania, but because the carrying and earning capacity so augmented are necessary to meet the conditions; and he will, I feel sure, admit to himself that railless cars, run on similar routes and fares, must have equal carrying capacity to render the same service to the people, and to obtain the same gross receipts. That this can be done on the working expenses set out in the paper criticised will be recognised as entirely out of the question.

This is the answer to Mr. Gribble's question about York. Trackless cars of equal individual carrying capacity, on similar services and fares, would earn as much as the tramcars per car-mile; but they could not be worked at the working expenses, and could not be bought for the same price as the cars assumed in Mr. Gribble's paper. Those small cars, he himself says, would not be suitable for York. But in his paper he holds them up as in every respect capable of replacing an equal number of tramcars for city services of any density.

As a side remark, it can be said that it is not easy to keep the 28 or 34-passenger cars within the weight limit enforced in Great Britain, and, speaking with a long experience of the Board of Trade in such matters, not to mention Parliamentary Committees or the Home Office, the suggestion to run trailers on trackless 'buses does not seem very hopeful.

As Mr. Gribble mentions Rotherham, one may add that the overcrowding of the small cars shows that tramcars on the same route, with the same fares and services, would earn more money; that the Rotherham tramcars earn 12·5d. on the average per car-mile, against the 10·35d. of the trackless cars; that the latter take about 3d. per passenger, and a fraction over three passengers per car-mile, and that the traffic is practically a point-to-point traffic. The Rotherham route looks a very proper one for a pioneer trackless service, and might not support the capital expenditure for a tramway, but the surveyor to the West Riding County Council gave evidence to a House of Lords Committee a few days ago that the Rotherham trackless cars cost 4d. per car-mile for wear and tear of roads; it is pretty clear, therefore, that the total cost with a tramway would be less, though differently distributed.

The question of power distribution and losses is, I agree, trivial on lines of the extent and character hitherto constructed in this country. But Mr. Gribble suggested in his paper systems comparable with those of the largest tramway undertakings; where the cost of distribution—capital charges and losses together—is of serious importance. A tramway has the equivalent of from 2 to 4 sq. in. of copper for its negative conductors, provided gratuitously, so to speak, but the trackless service has but one or two trolley wires on the negative side. Therefore it must have a duplicate feeder system, and little less than double the cost in capital charges and loss of energy in comparison with a similar tramway. This is said with full knowledge of the effect of the voltage-drop limitation on the use of the rails for return. It is also said after working out and constructing the distribution systems for a good many tramways, and calculating those for a few trackless lines. In extensive systems, feeders soon overtop the overhead construction in cost per mile, even on tramways.

Now, as to road costs, capital and maintenance, "Comparative Economics" means, surely, the comparison of all costs on an even basis.

If it is taken that it is the duty of the road authority to provide and maintain adequate roads for mechanically propelled vehicles plying for hire for profit, without charge to the owners thereof, very well, then we drop on both sides of the comparison the cost of concrete, substructure, and of paving, capital and annual. Then the tramway is only charged with its rails and fastenings and electrical equipment. On that basis, instead of the present unfair burden of paving, maintenance, and rating, there can be no question at all that a public transport service on definite routes can be given at a smaller total cost by electric tramways than by any other means at present known, wherever the traffic demands anything better than a 30-minute service; Mr. Gribble's own diagrams, corrected, prove it.

Or take it the other way. Charge the public service vehicles with the actual cost—capital charges and maintenance—of the roadway they use, and still the electric tramway comes out best, though by how much will depend on the special conditions of each case.

It has fallen to the writer's lot to give responsible advice in a great many cases, always after study of the particular conditions, without which such advice should never be given; and in some cases railless traction has been recommended; but as a general preliminary statement, under British conditions, and accepting the unfair burdens put upon tramways by those conditions, in any case where traffic calls for a headway of 20 minutes or less, the presumption is for a tramway as against trackless or petrol 'buses.

It is strange to hear that roads of the character of the London streets have scarcely any impression made on them by mechanical traction. That statement is emphatically contradicted by the statements, and by the accounts, of all the London road authorities, and by the extensive reconstruction of London streets still in progress; not to mention visual inspection of many of the streets carrying heavy motor-'bus traffic.

As to fares, any transport service which seeks to replace the electric tramways in large towns and cities has got to reckon with the same fares unless it gets a subsidy from public funds. Tramways have spread and are spreading, the working classes to an enormous extent to the outer suburbs, and a good thing too; it is utterly impracticable, having got the people out by low fares and frequent services, to substitute either higher fares or inferior services, and it is no use talking about Parliamentary rates of 1d. per passenger-mile for these cases.

Mr. Gribble and his colleagues have an ample field open to their enterprise and talent; they will only damage their own interests by trying to apply them to unsuitable conditions, and it does not seem very likely that they will get the opportunity to do so in this country for some time to come.

The Critic.

"Schoeller" Miners' Lamp Gas Detector.

In response to Mr. Turquand's further letter in to-day's issue, I beg to say the answer to the question he raises is in the affirmative.

W. Schmahl.

London, E.C., *May 29th*, 1914.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

New Recording Instruments.

MESSRS. ELLIOTT BROTHERS, of Central Buildings, Westminster, recently issued a new list of recording instruments, showing the improved types that they have introduced. Amongst these is a line of recording ammeters and voltmeters of the drum type, for use with charts changed daily; these are made in the portable form or for switchboard use, for A.C. or D.C. The design of the mechanism is generally similar to that of the other well-known instruments made by the firm.

The list includes a D.C. combined moving-coil ammeter and voltmeter with both records on one chart, that shown being a drum chart suitable for a feeder log. The instrument can also be supplied for any combination of two records, and with charts of unequal widths, as shown, or both alike. The two charts being printed on the same sheet of paper, absolute synchronism of the records is thus ensured.

Siemens Cables and Joint Boxes.

Messrs. Siemens Bros. & Co., Ltd., Woolwich, have recently issued a catalogue of paper-insulated cables for pressures up to 11,000 volts, and an exceptionally-comprehensive list of joint boxes, dividing boxes, service boxes, &c., from which we have selected a few examples. *Fig.* 1 shows an inverted end dividing

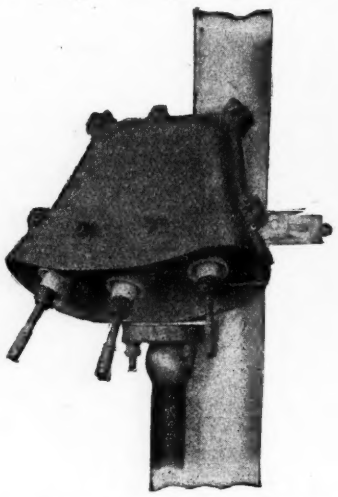


Fig. 1.—Siemens Out-door End Dividing Box.

box for underground to overhead lines, suitable for use out of doors for pressures up to 20,000 volts. Fig. 2 illustrates a straight-through joint box, showing the standard bonding method adopted for wire-armoured cables, in accordance with the Home Office

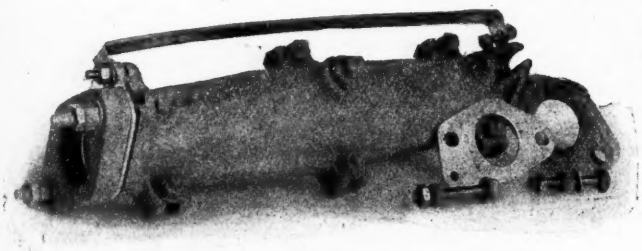


Fig. 2.—Straight-through Joint Box.

rules; the sheathing wires are clamped to the box against tinned brass plates, which are coupled together by a copper strap.

The company makes a speciality of crane boxes, of which large numbers have been supplied. A separate section is devoted to mining accessories, and the Home Office regulations for the use of electricity in mines are given in full.

A Vickers Motor Drive.

An example of a Vickers motor drive is given in fig. 3. Each of the three motors is of 3 H.P., 1,100 R.P.M., and drives 24 sewing machines, arranged in a double row of 12, and the 2-H.P.

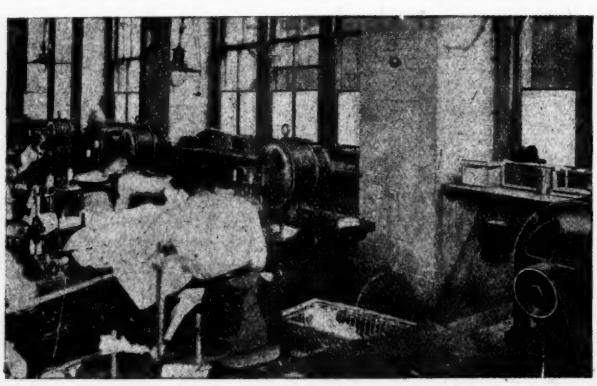


Fig. 3.—Vickers Motors Driving Sewing Machines.

motor on the extreme left operates 14 machines. In the latter case, however, the sewing benches are located in sections. The 2-H.P. motor seen on the right is driving the single row of 10 sewing machines. A general view of the sewing machine room is given in fig. 4.

The average daily run of the machines and motors is 10 hours, which has been well maintained for years. Among the advantages

Fig. 4.—General View of Sewing Machine Room with Electric Drive.

of this drive are no liability of dropping oil from the shafting, and better light and ventilation for the operators.

The views are of Messrs. Greenlaws' (London) shirt-making factory, and the motors are by the Electric and Ordnance Accessories, Ltd., of Aston, Birmingham.

Simplex Factory Fitting.

Fig. 5 shows a special fitting which has been designed for factory installations by Messrs. Simplex Conduits, Ltd., of Garrison Lane, Birmingham, and has been found to be most convenient and suitable for the severe conditions in this class of work. It is designed to provide a convenient form of pull-switch, and consists of a special water-tight box with a 5-ampere standard type of switch fitted inside, operated externally by a lever and chain. The

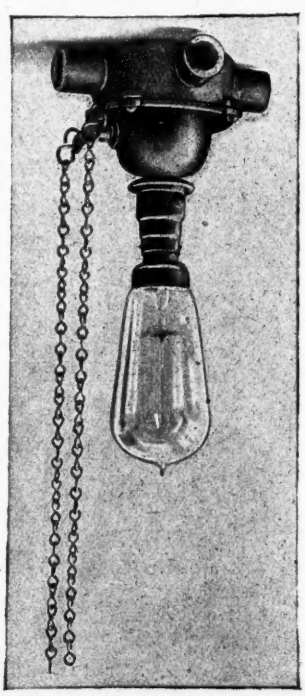


Fig. 5.—Factory Fitting with Pull-switch.

movement is similar to that obtaining in the company's standard form of water-tight switch, and gives a very quick and independent break. The dome cover, as will be seen from the view, is fitted with a standard type of water-tight lampholder, so that in this case the light would be actually on the ceiling, but, where required, the fitting can be provided with any length of tubing drop, so as to lengthen the distance between the light and the ceiling.

Resistance Nets.

We have received from the Schniewindt Electric Co., of Staniforth Street, Birmingham, a sample of a new type resistance net manufactured by them, in which the ribbon is woven perpendicularly to the webbing instead of flat as formerly, enabling nets to be produced with 300 per cent. greater ohmic

resistance for a given capacity. Messrs. Schniewindt can supply the new type net to carry up to 200 amperes; they can be woven with ribbons up to 1 in. in width, and with two or more ribbons

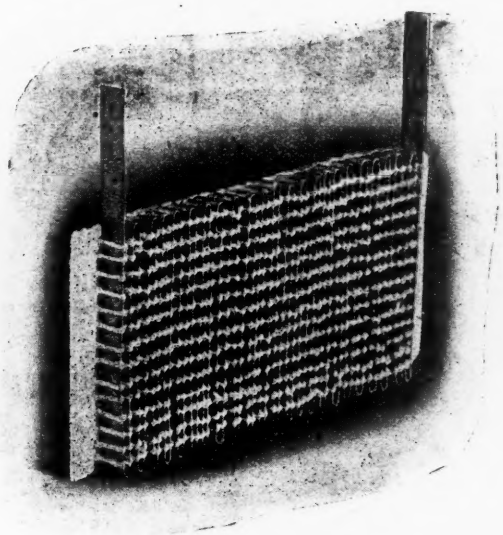


Fig. 6.—New Type Resistance Net.

in parallel. The convenience of the Schniewindt resistance net is well known, and the new type appears to be a great advance on the old

Insulating Materials.

The Radium Electric Co., of 82, Hatton Garden, E.C., which has taken up the sole representation in this country of Messrs. Gebrüder Adt A.G., has brought to our notice a wide range of insulating materials for electrical purposes; of these a great variety are made of compressed paper, for use in dry places, such as spools for small coils, casings for switches and fuses, bushes and washers, dry cell cases, &c. Some of these are shown in fig. 7;

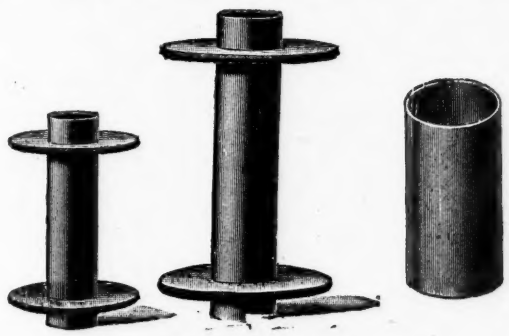


Fig. 7.—Compressed Paper Articles.

those that we have seen are hard, resonant and admirably moulded to shape. Others are made of a very different material called "Australit," which is hard, dense, and fire-resisting to a high degree, being capable of withstanding a temperature of 200° C.

Fig. 8.—Articles Made of Moulded Australit.

permanently, or 250° C. temporarily, without any deformation. Australit is suitable for switch-handles, lamp-holders, hand-wheels, parts of heating and cooking apparatus; it can be moulded accurately, and has a high tensile strength, while it is a good insulator for electricity and heat. Some of the forms that it may take are shown in fig. 8, including, besides those mentioned above, a portable lamp and an example of special moulding to pattern. The material is tough, and almost unbreakable, and should be found useful for many purposes.

Self-Cleaning Water Strainer.

The London Electric Supply Corporation, Ltd., of 25A, Cockspur Street, S.W., having overcome the troubles met with in straining the Thames water for use in their surface condensers, have placed their experience at the service of others, by bringing out the "Deptford" patent self-cleaning water strainer. This device occupies very little space, although it has a large straining surface, which is constantly being thoroughly cleaned; the strainer is a gun-metal drum perforated with small holes through which the water passes inwards, being afterwards led away to the condenser through one of the end covers. The drum revolves three or four times a minute, in contact with a sharp scraper; the solid matter adhering to the drum is thus removed and falls into a hopper below the drum, whence it can be discharged by opening a sludge-valve. Two of these strainers have been at work with satisfactory results for three years, during which period no renewals have been required, and the cost of maintenance has been trifling. The strainer is made in four sizes; the largest dealing with one million gallons of water per hour; the design is simple and inexpensive, and the power required for its operation is practically negligible.

The "Kingsway" Tolling Bell.

The General Electric Co., Ltd., of 67, Queen Victoria Street, E.C., have brought out a new type of electric bell for use in factories as time-bells, fire-alarms, &c., in which an improved contact-making device is employed. As shown in fig. 9, the bell is carried on a cast-iron bracket, and the mechanism is housed in a cast-iron box from which the striking hammer is seen depending in the stationary position. When current is switched on, an electromagnet attracts an armature connected to the hammer, and causes the latter to strike the bell; the circuit is broken at the same time, and the hammer swings back as a pendulum without remaking the circuit; but when the hammer commences the forward swing towards the bell, the circuit is again completed, and the hammer strikes a very powerful blow on the bell, the

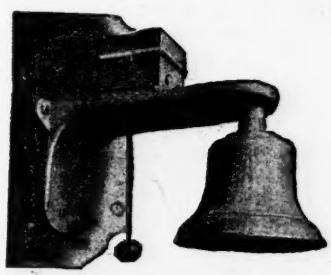


Fig. 9.—Kingsway Electric Tolling Bell.

cycle of operations continuing at regular intervals so long as the pressure is on the circuit. The essential feature of the device is the contact-making mechanism, which is self-cleaning, and is so arranged that the circuit is only closed during the forward stroke of the hammer. Sparking at the contacts is prevented by a non-inductive resistance connected across them. The bell is struck twice per second, or at a slower rate if the hammer-rod is lengthened; it is made in two sizes, of the best bell metal, the one illustrated being 12 in. in diameter, and weighing about 42 lb., while the larger one is swung from a massive cast-iron table, weighs 132 lb., and is 17 in. in diameter. These bells take only 1 ampere at 15 and 25 volts respectively, so that primary cells can be employed to toll them. The mechanism is weather-proof, and can be fitted to existing bells.

A New Lamp Lock.

An extremely ingenious lamp-locking device has been brought out by Messrs. C. G. M. Bennett and C. H. Jeffcoat, of 148, Addison Gardens, W., for use in conjunction with the Benjamin china back-plate lampholder. The "Lamlok" locking devices introduced by the same inventors are inapplicable to this holder, owing to its construction almost wholly of porcelain; and as the holder is much used in places accessible to the public, the need of a lock is evident. It happens that in order to produce the bayonet-fastening in the china barrel, the manufacturing process necessitates the presence of two slots extending through the base of the holder; a suitably-designed brass trigger can be dropped into one of these slots, and is so shaped at the lower end that while it offers no obstruction when the lamp is inserted, it absolutely prevents its unauthorised removal. Nothing could be simpler, and the inventors' ingenuity deserves all praise. The lamp can easily be removed with the aid of a key, equally simple, but further public reference to this part of the device might defeat the object of its existence. We, therefore, content ourselves with the statement that we have seen and tried the invention, which has been provisionally protected, and it seems admirably adapted for its purpose.

E

A Witton Motor Drive.

An installation which has been laid down on model lines is found in the factory of a well-known firm of wholesale chemists and druggists, Messrs. Wilkinson & Simpson, of Newcastle-on-Tyne. In this factory power is used for driving mixing vats employed in the preparation of metal polish and sauces, and for driving bark disintegrators used in the preparation of medicines, for the mixing of health salts, baking powder and other similar products. In the proximity of the grinders and mixers there is naturally a certain amount of fine dust, and the Witton motors employed for driving are, for the most part, enclosed in glass houses, several motors being grouped in one house wherever possible. The motors are fixed sometimes on the ceiling, but more usually on brackets projecting from the wall, and drive the plant through belting. The switchgear is mounted on the wall and is readily accessible.

A view in one of the large motor houses is shown in fig. 10.

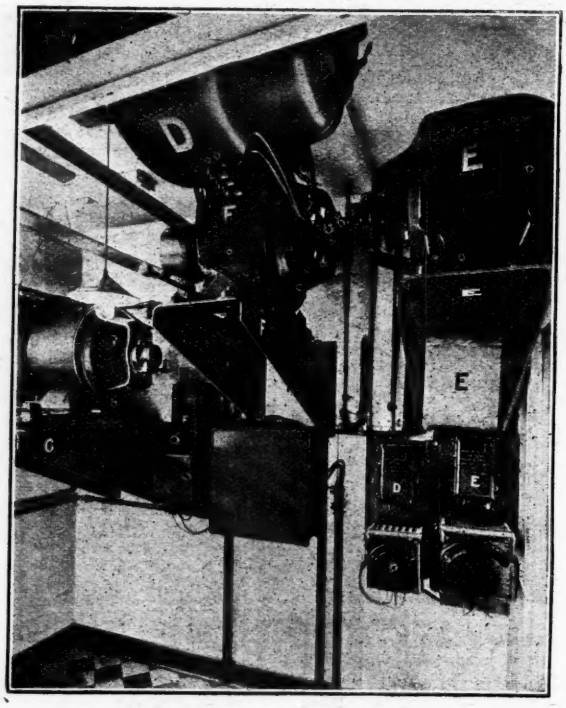


FIG. 10.—INTERIOR OF MOTOR HOUSE AT A CHEMICAL FACTORY SHOWING WITTON MOTORS AND G.E.C. SWITCHGEAR.

This motor house contains four motors of 18 H.P., 15 H.P., 7½ H.P. and 6 H.P. respectively. In addition to the purposes previously mentioned, electric drive is also used for the working of hoists and a number of ventilating fans, a considerable number of motors of similar size to those mentioned above being utilised in various parts of the works.

The installation was carried out by Messrs. T. Toward & Co., Ouseburn, Newcastle-on-Tyne, the motors and switchgear being supplied by the General Electric Co., Ltd., of Witton, Birmingham.

A Table Cooker.

We illustrate in fig. 11 a 600-watt cooker and stove by MESSRS. DRAKE & GORHAM, LTD., of Felix Street, Westminster Bridge Road, S.E., with which special flat-bottom utensils are not required.

FIG. 11.—AN ELECTRIC TABLE COOKER.

The stove heats up to full temperature in 50 seconds, and can be connected to an ordinary lamp socket.

It consists of a nickled pressed steel frame with a burnished heat reflector and coil tube heating elements arranged to give a concentrated mass of red heat, and can be used for frying, toasting, boiling and heating generally. It is 7¾-in. diameter and 4 in. high overall.

Contact Suspension Devices.

We illustrate in fig. 12 a new type of contact-suspension device for extra-high-tension circuits, which has been introduced by the LONDON ELECTRIC FIRM, of Croydon.

Both the body and plug are mounted on special corrugated and petticoated porcelain insulators; the suspension feature is the well-tried one, embodying two ratchets in circular form, one superimposed above the other and set at an angle from it. Every alternate tooth in the lower ratchet is cut away to first allow the pins to enter and trap the plug, the second cycle releasing the same and allowing it to pass out.

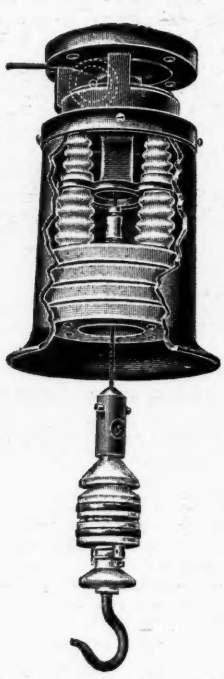


FIG. 12.—NEW CONTACT-SUSPENSION DEVICE.

FIG. 13.—WIRE-ROPE PROTECTOR.

To operate the gear, the winch line is drawn up, and the pins, or horns, on the plunger engage with the ratchet and travel up the inclined face of the upper half until the line can be drawn no further; the winch is then slightly reversed, gravity brings the pin straight down, where it is trapped in the ratchet. To lower, the winch line is hauled up again until the pin reaches a dead stop, and a second reversal of the winch lowers the plug with its lamp clear to the ground for trimming. The wire rope is only used for hauling and lowering the lamp, and not for suspending it—an important feature where the continual swinging, due to wind, &c., might cause the rope to give out and drop the lamp to the ground.

In addition to its self-sustaining winch, the firm evolved (to meet the modern high-speed conditions of trimming 80/100 lamps per day) a quicker operating one, which practically fulfils the condition of "dropping the lamp," and at the same time possesses the valuable feature of being self-sustaining both in raising and lowering, without any small ratchets, pawls, springs or triggers; this assures the absolute safety of the lamp under all conditions, whether the handle slips or breaks or the winch becomes otherwise interrupted in operation.

Fig. 13 shows an improved wire rope protector, which is sufficiently flexible to go round the swan neck or other restricted part of a lamp column, and effectually overcomes the old trouble of chafed cables inside the lamp pillar, as the rope works in what is practically a closed conduit throughout its length.

The Wilson Trust.—LOANS TO YOUNG MEN.—It is an axiom among business men that the third year of trade is the most critical. The late Mr. Samuel Wilson, no doubt, had this fact in mind when he originated the important bequest which provides for the loaning of sums ranging from £100 to £300 to young men who have carried on business for one year, and not more than three years, in the City of London, or within five miles thereof. The loans are granted for five years upon unquestionable personal security being provided. Full particulars of the bequest may be obtained from the Clerk of Wilson's Trust, Chamber of London, Guildhall.

WIRELESS TELEGRAPHY.

In the course of a paper read before the North-East Coast Institution of Engineers and Shipbuilders on April 23rd, the author, Mr. H. Fothergill, admirably summarised the present state of the art of wireless telegraphy. Some extracts from the paper are given below.

Fig. 1 shows diagrammatically a popular arrangement of the Marconi system. The electric current is generated by an alternator and passed through the primary coil of a low-frequency, iron-core transformer by which its voltage is increased to that required for charging the condenser in the oscillatory circuit. "The low-frequency or alternating circuit includes additional inductance either in the transformer primary or secondary circuit adjusted so that the natural period of the alternator-transformer-condenser circuit corresponds with the alternator frequency; this adjustment is provided so that the condenser charging current may be about zero value when the condenser is about to discharge." The oscillatory circuit comprises a condenser, the primary coil of a high-frequency air-core transformer, a variable inductance for altering the wave length, and a disc discharger by which the condenser is discharged. This discharger consists of a

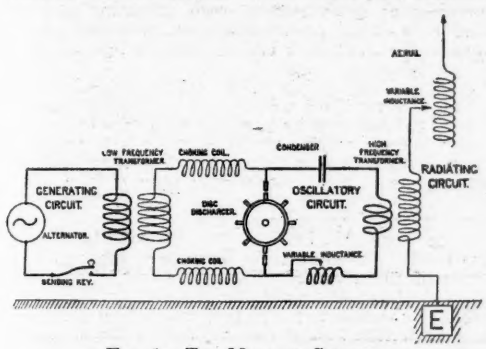


Fig. 1.—The Marconi System.

revolving toothed wheel placed between two stationary teeth, so that every time a pair of teeth comes opposite the stationary teeth, the current sparks across and the condenser is discharged. The time of charge corresponds to a half cycle of the alternator, and to the period during which there are no moving teeth opposite the two stationary teeth.

The radiating circuit in Fig. 1 includes the secondary coil of the high-frequency transformer by which energy is absorbed from the oscillatory circuit and radiated from the aerial wire in the form of electromagnetic waves. A variable inductance is included in the radiating circuit for the purpose of varying the wave length so that it may be brought into tune with the oscillatory circuit. To send a signal, the sending key is pressed down and thus allows the current from the alternator to flow through the primary coil of the low-frequency transformer, which induces a high-voltage current in the secondary coil. This high-pressure current passes round the circuit and charges the condenser, which is periodically discharged, say 450 times per second, by the revolving toothed wheel. Each condenser discharge produces a group of electric oscillations, which by passing through the high-frequency transformer, induce oscillations in the radiating circuit which alternately charge the aerial wire in opposite directions, and in so doing produce electromagnetic waves which are propagated outwards in all directions over the surface of the earth. Choking coils are placed between the low-frequency transformer and

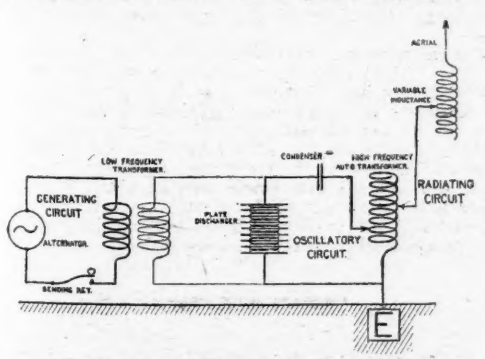


Fig. 2.—The Telefunken System.

the oscillatory circuit, for the purpose of preventing the high-frequency oscillations from passing into the low-frequency transformer and doing possible damage.

The Telefunken system is illustrated diagrammatically in Fig. 2, from which it will be seen that it is similar to the Marconi system; the two companies, however, agreed upon terms which avoided litigation. The principal differences between the two systems are the method of discharging the condenser, and the method of exciting or producing oscillations in the radiating circuit. The discharger, which is illustrated diagrammatically in section in Fig. 3, consists of circular plates of copper separated from each other by mica distance-pieces about .2 mm. in thickness. The spark forms at any point on the flat surface of the plates; it is then forced towards the periphery in a radial direction by the electromagnetic field, and is eventually extinguished on its path by a circular groove which the spark cannot bridge. Between each pair of plates is a large disc of thin copper, which is effective in radiating the heat generated by the spark. Short-circuiting

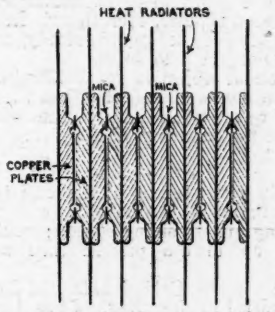


Fig. 3.—Quenched-Spark Discharger.

plugs, which can be inserted between the copper discs, are provided in order to short-circuit as many gaps as may not be required. The quenched-spark discharge may thus be adjusted to suit the voltage and consequently permit of variations in the power utilised. Since the energy transmitted varies as the square of the number of spark gaps, the regulation by short-circuiting covers a wide range. The pressure per gap is approximately 1,200 volts. The radiating circuit is not indirectly coupled to the oscillatory circuit as in the Marconi system, but is directly coupled by what may be called an auto-transformer, consisting of a copper helix, one part of which is included in the oscillatory circuit, the other part forming a portion of the aerial or radiating circuit.

The action of a coupled-circuit transmitter, whether on the Marconi or Telefunken system, is less simple than would appear at first sight. Just as the currents flowing to and fro in the oscillatory circuit induce similar oscillations in the radiating circuit, so do the induced currents oscillating in the radiating circuit tend to react on the oscillatory circuit.

It was with the object of obviating this wasteful surging and usefully employing the whole of the energy for the radiation of waves, that the Marconi and Telefunken dischargers were introduced, and with this object in view the spark is cut off or extinguished immediately the energy in the oscillatory circuit is first absorbed by the radiating circuit.

If a Marconi revolving disc discharger is suitably designed and run at a predetermined speed, the period during which two moving teeth are passing the two stationary teeth is equal to the period during which the whole of the energy is originally transferred to the radiating circuit; and as the spark is then extinguished, the teeth having moved on, it is impossible for the energy in the radiating circuit to flow back into the oscillatory circuit. The result is that the oscillations continue in the radiating circuit with a steadily decreasing amplitude. During this time the condenser is again being charged ready for discharge by the next two moving teeth which pass the two stationary teeth, when a new series of oscillations will be induced in the radiating circuit. This true effect is obtained with discs running with high peripheral speed, and working with long waves and loose coupling, as the disc may then be arranged to cut off a discharge or spark before any material part of the energy communicated to the aerial is returned to the oscillatory circuit.

In the Telefunken discharger the extinguishing of the spark is effected by the electromagnetic field in which the spark occurs, the field having the peculiar property of forcing the spark outwards at a high velocity. Thus as soon as the energy in the oscillatory circuit is at a minimum and the spark is weakened, it is blown out during its passage through the air space between the copper plates. The oscillatory circuit is therefore broken when the energy absorbed from it by the radiating circuit has reached a maximum, and consequently the oscillatory circuit is unable to reabsorb energy from the radiating circuit, in which the oscillations continue until the next condenser discharge occurs. The action of these quenched-spark devices, particularly the large Marconi discs, is very important, as by their use it is possible to produce series or groups of slightly damped electric oscillations which compare very favourably with the undamped or persistent oscillations produced by continuous-wave systems.

At the present time there are two notable systems which produce undamped or continuous waves.

In theory the Goldschmidt system approaches very closely to the ideal; but so far it has been unfeasible to carry out in practice what appears so desirable in theory.

The inventor has not yet exceeded a frequency of 40,000 per second, which is a long way short of 1,000,000, the fre-

quency required for the 300 metre wave. The system is therefore unsuitable for short wave lengths, and is not likely to come into use for ship-to-shore signalling.

The wave length corresponding to a frequency of 40,000 per second would be 7,500 metres, a wave length which has been frequently used, and therefore the system could be employed for long-distance signalling, but apparently from the negotiations between the Postmaster-General and the Goldschmidt Company in Germany, the system has not yet proved itself reliable.

If the arc employed in the Poulsen system could be constructed of such a size that it could deal with sufficient energy for long-distance signalling, and maintained in a stable condition, then there seems to be no reason why such a system should not become popular, even though its efficiency is very low. But the arc does not remain steady, and it would seem unreasonable to expect it to do so.

The most serious objection to the Poulsen system is not, perhaps, the weakness of radiation, but the variations in the length of the waves transmitted, which result in the signals disappearing at the receiving station owing to the transmitter getting out of tune.

The advantage of a continuous-wave system—if any—must be looked for in better tuning at the receiving station, and in less loss while the waves are travelling over the space between the transmitting and receiving station; neither of which advantages has up to the present time been satisfactorily demonstrated.

As the load on the Goldschmidt and Poulsen generators must not be varied in signalling, as this would affect the frequency, in both systems the generator is continually under load, and the intermittency necessary for the dots and dashes of the Morse code is produced by varying the wave length in the aerial circuit so that at times it is out of tune with the receiving station. In the damped-wave or spark system, the generator supplies energy only when the sending key is pressed down, and as the average spacing time between signals transmitted is 40 per cent. of the total time, it will be seen that a saving of 40 per cent. is obtained with the undamped-wave or spark system.

The efficiency of the Marconi disc discharger at Clifden is in the neighbourhood of 75 per cent., this figure representing the proportion of energy in the aerial as compared with the output of the dynamo. The efficiency of the arc method is only 14 per cent., this figure having been given by Dr. Poulsen himself. The efficiency of the Telefunken system compares very favourably with the Marconi system, and is said to be about 60 per cent. It should be stated, however, that it is doubtful how far these efficiencies are applicable for the purpose of comparison between the different systems, as the only satisfactory comparison is between the primary energy at the transmitting station and the strength of the signals received at the receiving station.

Interference from atmospherics is liable to be greater in the case of the Poulsen and Goldschmidt continuous-wave systems than in the case of a discontinuous-wave system, which may be either a damped-wave system or a variation of the Marconi continuous-wave system, wherein the continuous waves are cut up at the transmitting station. It will perhaps be of interest to state that in the Marconi continuous-wave system the waves are produced by impulsing the aerial at frequent, regularly spaced intervals, the impulses being timed so as to maintain the oscillations in the aerial. As the wave length is determined by the inductance and capacity of the circuits, and as the impulsing is regulated by a disc running independently, and not affected by the load, the transmitted wave length is independent of the load also, and consequently the system lends itself to the highest degree of selective working, in contradistinction to the Goldschmidt and Poulsen continuous-wave systems, where the transmitted wave depends in the one case on the speed of the alternator, and in the other case on the condition of the arc.

The Marconi Company have been working on a commercial scale for several years between Clifden in Ireland and Glace Bay in Canada, a distance of about 2,300 miles, and it should be mentioned that messages can be sent at night a distance of 5,849 miles from Clifden to Buenos Ayres. The Telefunken system, although largely used, has not yet been commercially employed for distances of 2,000 miles; but experiments are now being made at night between Nauen and Togo, a distance of 4,000 miles. The Poulsen system has been tried between San Francisco and Honolulu, a distance of 2,100 miles, but no evidence has been obtained as to its practicability over this distance, and it is doubtful whether a stable arc can be produced of sufficient size to charge an aerial with high power. There appears to be no evidence to show that the Goldschmidt system has been used over long distances, although it is anticipated that long-distance transmission will be accomplished at an early date.

Some particulars are given of the Marconi stations in course of erection in connection with the Imperial wireless chain. The wave lengths of all stations will be as great as possible within the limits of 15,000 and 50,000 feet (consistent with keeping the capacity, inductance and size of the aerials within reasonable limits) in order to ensure reliability of reception at all times of the day and night; but the wave lengths transmitted from any one station will be in all cases at least 25 per cent. different from those transmitted from other stations within its normal range, and with which it has to communicate. In all cases there will be a difference of 5 per cent. between the wave lengths emitted from any one station in order that each corresponding receiving station with which this station has to communicate may be able to tune out the waves emitted by the said station for the other station or stations with which it is also communicating. Where a station is required to communicate in more than one direction, a separate transmitting aerial and a separate receiving aerial will be provided for each direction. The note of each station will be different from those of any other stations within its range, but the notes of each transmitting circuit in any one station will be identical.

The power plant at each station will be in duplicate, and will include two water-tube boilers, each capable of generating sufficient steam for the whole requirements of any one transmitting circuit. In the case of stations required to send in two directions three boilers will be provided; and in the case of the station in Egypt, which is required to transmit in three directions at the same time, four boilers will be provided.

The boilers will supply steam to turbines directly coupled to alternating-current generators which in turn will be coupled to revolving disc dischargers. The total power, including spares and auxiliaries at the terminal stations, will be approximately 1,300 H.P., and the power at the intermediate stations will vary from 1,900 H.P. to 2,500 H.P. Two auxiliary sets will be provided at every station, each consisting of a turbine coupled to a direct-current generator for supplying exciting current to the alternators and current for lighting and other auxiliary purposes.

The transmitting aerials will be of the multiwire-directional type and will consist of a number of horizontal parallel wires supported 300 feet high by 10 masts, each wire being composed of seven strands of No. 19 S.W.G. silicon bronze wire and brought down at one end to the transmitting station. The masts will be of the sectional steel tubular type, the aerial wires passing through insulators attached to triatics stretched between pairs of masts, each mast being capable of withstanding a permanent horizontal strain of not less than 2 tons at the head of the mast, in addition to windage calculated at the rate of 30 lb. per effective square foot. The centre line through the horizontal portion of the aerial will coincide with the line of direction of the station with which it is desired to communicate, the free or elevated end of the aerial pointing directly away from the communication station. The size of the aerials in each case will depend upon the length of wave emitted, but in no case will the length of each aerial be less than one-twelfth the wave length that the aerial is required to radiate.

The earth system will consist of a series of galvanised iron plates buried in a symmetrical position relatively to the station house and connected to it by a system of radial conductors of galvanised iron wire leading to each plate from another set of plates buried around the station building. This arrangement will be supplemented by a number of longitudinal earth wires running parallel to and below the horizontal wires of the aerial.

Each transmitting circuit at each station will be provided with five transformers and a condenser consisting of about 500 cells. The high-frequency transformer for each circuit (refer to Fig. 1) will comprise a multistranded primary conductor forming part of the oscillatory circuit, and a secondary winding connected to the radiating circuit and consisting of a special solenoid of similar cable to the primary winding but of smaller size. These primary and secondary windings will be entirely separate and arranged to be moved away from each other so that the coupling of the two circuits may be varied. The disc discharger in the oscillatory circuit will consist of a studded wheel, the number of studs corresponding to the number of the alternator poles, so that the condenser can be discharged at the moment of maximum amplitude in each alternation of the current. The two side electrodes, between which the moving studs pass, are of special construction and consist of slowly revolving discs so as continually to present a cool surface for the electrical discharge between them and the studs.

The receiving and operating stations will be not less than 10 miles distant from the transmitting stations, and will be provided with balancing aerials so as to prevent interference by the waves radiated from an adjoining transmitting station. The receiving aerials will consist of one or more silicon-bronze, stranded conductors about 8,000 feet long and arranged similarly to the wires of the transmitting aerials. The operating room will be fitted with Morse hand keys and Wheatstone or other automatic transmitters of similar type. These will be connected by means of wires to the transmitting station which will be operated from the receiving station.

An Undesirable Bed-Warmer.—A fire, which might have been accompanied by disastrous results, was recently caused in a curious way by a storage battery which had been temporarily placed beneath a bed. The occupant of the room in sitting on the bed caused the springs to sag, short-circuit the battery terminals, and fuse, thereby burning a hole in the mattress and setting fire to the bedding. The battery had been removed from an automobile and was being stored for the rest of the winter beneath the bed.—*Electrical World.*

BUSINESS NOTES.

Catalogues and Lists.—Sunderland Forge and Engineering Co., Ltd., 31, Budge Row, Cannon Street, E.C.—40-page catalogue containing full descriptive matter, with photographs and prices, relating to electric winches for ships, shipyards, docks, &c. A list of some of the vessels provided with these winches is given in a separate folder.

Edison & Swan United Electric Light Co., Ltd., Ponder's End.—Six-page illustrated price list of electric fans, some new patterns of convertible table or bracket fans, ceiling, ring, or porthole fans, for the current season, being included.

British Thomson-Houston Co., Ltd., Rugby.—Price list No. 2,520 contains brief illustrated particulars and fully tabulated prices of their motor and generator pulleys.

Adnil Electric Co., Ltd., Artillery Lane, London, E.C.—List AE 61 gives tabulated speeds, voltages, prices and code-words of small power A.C. and D.C. motors and sewing machine equipments. List AE 64 is a 12-page illustrated pamphlet showing a number of fittings for half-watt lamps—outside shop window and indoor fittings—shade-holders for Goliath screw sockets, Goliath holders with spring-tongue contacts, and semi-indirect half-watt fittings. Prices, shipping weights and dimensions are tabulated.

The London Electric Supply Corporation, Ltd., 25A, Cockspur Street, London, S.W.—Illustrated list describing the "Deptford" patent self-cleaning water strainer for condensing plants, &c.

Mr. E. Ingram-Hill, 26, Stanton Road, Wimbledon, S.W.—Pamphlet concerning technical advertising and his readiness to assist firms in the electrical and engineering industry.

The Sloan Electrical Co., Ltd., Conradty House, 12, Golden Lane, E.C.—Price list showing the "Hofmann" patent rivet jointers, and "S L" wire-joining tubes and tools, with which sound electrical joints can be made very quickly, without solder.

Messrs. Edison Accumulators, Ltd., 2 and 3, Duke Street, London, S.W.—28-page publication entitled "All about Edison Accumulators." Some notes regarding the invention of the battery are followed by details of its construction, advantages, "the Edison guarantee," the application of the battery for traction and non-traction services, tabulated data, prices, dimensions and characteristics, instructions and general information. The list is well illustrated, and should be useful to those interested in electric vehicles, ignition, &c.

The Electrical Apparatus Co., Ltd., South Lambeth Road, London.—Folder No. 5 gives illustrations and brief particulars of starters for direct-current motors up to 200 H.P.

Bankruptcy Proceedings.—William Henry Pease, electrical engineer, 19, Princess Royal Terrace, Scarborough, York.—The adjourned public examination of the above debtor was held last week at the County Court Hall, Bank Street, Sheffield. In reply to questions by the Official Receiver, debtor stated that he owed £769 and £4 odd for rent. The assets were estimated at £249. His total losses during the past two years had been £560. In February, 1912, and in August last, he had had recourse to moneylenders. He commenced business in Scarborough in March last because he thought there was an opportunity as there was only one man to compete against. He attributed his failure to bad health and losses on contracts. The case was concluded.

J. W. Garsden (J. W. Garsden & Co.), electrical engineer, Blackburn.—July 6th is fixed for the hearing of debtor's application for discharge, at Blackburn County Court House.

Chas. Blake (Bilston Electrical Co.), electrical engineer, Bilston.—An amended notice appears in the *Gazette* to the following effect:—"First and final dividend 8s. 3d., payable June 3rd, at Official Receiver's Office, 30, Lichfield Street, Wolverhampton."

Joseph Swainson (J. Swainson & Co.), electrical contractor, 22, Bootle Street, Manchester.—June 16th is the last day for receipt of proofs for dividend. Mr. A. Yearsley, 27, Brazennose Street, Manchester, trustee.

C. H. Kitching, plumber and electrical engineer, Hull.—Application for debtor's discharge is to be heard on July 8th.

F. J. Behrens, electrical engineer (trading as Fred. Burns), Market Street, Barnsley.—June 17th is the last day for the receipt of proofs for dividend. Trustee: Mr. B. S. Briggs, Official Receiver, 21, King Street, Wakefield.

Book Notices.—"Electric Light Accounts and their Significance." By H. M. Edwards. London: Hill Publishing Co., Ltd. Price 8s. 4d. net.

"The Mechanical Design and Construction of Generators." By R. Livingstone. London: *Electrician* Printing and Publishing Co., Ltd. Price 9s. net.

Messrs. W. & G. Foyle, of 121-123, Charing Cross Road, W.C., have sent us a copy of their catalogue of technical and scientific books, both new and second-hand, including a wide range of works on electricity and electrical engineering and the allied sciences.

Dissolutions and Liquidations. — Cambridge Electric Tramways Syndicate, Ltd.—This company is winding up voluntarily with Mr. A. W. Langbam as liquidator. A meeting of creditors is called for June 13th.

Hopkins and Darley, electrical, mechanical and motor engineers, St. Alban's Road, Watford.—Messrs. J. Hopkins and L. Darley have dissolved partnership. Mr. L. Darley attends to debts.

Wheatley Engine Co., oil engine makers, Armley, Leeds.—Messrs. J. R. Wheatley and A. M. Lowery have dissolved partnership. Mr. Wheatley will attend to debts and continue the business.

Trade Announcements.—The Davis Electrical Co. are giving demonstrations of "Delcoblast" and its use at 17, Moor Street, W., twice a day during June.

Messrs. Pritchetts & Gold, Ltd., have just removed to their new works at Dagenham Dock, Essex, to which address communications such as have hitherto been sent to Feltham, should in future be sent. The new works have facilities for a greatly increased output, and have better access to rail and river. The address of the London office, 58, Victoria Street, S.W., remains unchanged.

Mr. Fred. S. Lee has recently commenced business in electric supplies on his own account at 418, George Street, Sydney, N.S.W., and he invites manufacturers and agents to send him information respecting electrical apparatus, particularly accessories. Mr. Lee was for seven years with Messrs. Lawrence & Hanson; for 4½ years with Messrs. Noyes Bros., as manager of their electrical supplies department; and was manager of the G.E.C., South Australian branch.

The British Insulated and Helsby Cables, Ltd, are about to build new offices at their Helsby works.

The telephone number of the Record Electrical Co, Ltd., of Caxton House, has been changed to "Victoria 6700" (two lines).

LIGHTING and POWER NOTES.

Atherton.—Proposed Loan.—The U.D.C. has decided to apply to the L.G.B. for sanction to borrow the following sums to meet the cost of supplying electricity to Laburnum Mills:—£900 for transformers, £250 for switchgear, and £1,850 for mains.

Barnstaple.—Year's Working.—The gross profit for the past year of the Corporation electricity department amounted to £2,201, a decrease of £136 on the previous year, which is more than accounted for by the increased price of coal. Net sales yielded £5,222, an increase of £414, and there is a net surplus of £104.

Belfast.—Expert Advice.—The Tramways and Electricity Committee has approved of a recommendation that the services of Mr. J. F. C. Snell and Mr. W. J. Pratten (Belfast) be obtained to report on the present condition of the plant at the generating station, and the future development of the electricity undertaking.

Bexley.—The U.D.C. has informed the Foots Cray E.S. Co. that, subject to the necessary loans being sanctioned by the L.G.B., and to the agreement being determinable by either side at the end of 7 or 14 years by two years' notice, the Council will supply electricity to the company at an average price of 1·45d. per unit.

Blackburn.—Annual Accounts.—We have received from Mr. Wheelwright, the borough electrical engineer, a copy of the year's accounts of the electricity undertaking. The income for the year was £48,400, the gross profit £24,217, and the surplus £5,037, as against £5,545 in 1912-13. Some 7,200,000 units were sold, including 3,800,000 for power, motors of 6,000 B.H.P. being connected to the mains. In view of the demand for energy from adjoining areas and for local industries, it is pointed out that the site of the proposed new power station will require to be settled in the near future. The report contains a series of excellent charts showing the ordinary and power load curves, the latter being for the three-phase mill supply.

Extension of Supply.—The Electricity Committee has decided to extend the supply of electricity to the Mill Hill district

Blackpool.—Electric Cooking.—All the cooking at the new dining and tea room of the Blackpool Tower Co. is to be done by electricity, the equipment having been supplied by Messrs. Jackson, Ltd., of London.

Blean (Kent.).—Overhead Wires.—The R.D.C. has decided to refuse consent to the erection by the Whitstable E.L. Co. of poles for overhead wires in the Council's area for the supply of electricity, on the ground that the poles would be unsightly and dangerous to traffic.

Brighton.—E.L. in Workmen's Dwellings.—The Health Committee has decided to install E.L. in 12 more houses in Tillstone Street; the electrical engineer has reported that the scheme so far has given every satisfaction, and the cost to the tenants works out at 6d. per week per house.

Workhouse Lighting.—The B. of G. has decided to have the E.L. installed in the North Ward of the workhouse, at a cost of £42 for materials, the work to be carried out under the supervision of the master.

Burnham (Somerset).—Street Lighting.—The U.D.C. has accepted a scheme for improved public lighting by electricity.

Cannock (Staffs.).—WORKHOUSE LIGHTING.—The B. of G. has appointed a Sub-Committee to consider the question of lighting the workhouse premises and offices with electricity.

Colne.—PROPOSED NEW PLANT.—The Electrical Committee has further considered the report submitted by the electrical engineer upon the proposed installation of new generating plant, and has recommended that Mr. S. J. Watson, electrical engineer, of Bury, be consulted upon the scheme.

Colwyn Bay.—The Council has retained Mr. E. M. Lacey to advise regarding the proposed new electricity works.

Continental Notes.— GERMANY. — Messrs. Brown, Boverie & Co. have on order a 40,000-H.P., 10,000-11,000-volt, 50-cycle turbo-generator, which, with condenser, will weigh 385 tons, and is to be installed in the public generating station at Elverlingsee, near Hagen.

An electrical exhibition is to be held in Frankfort-on-Main in August and September. The hall has an area of over 10,000 sq. metres, and is likely to be well filled. It will be remembered that the 1891 Frankfort Exhibition played an important rôle in the history of electrical transmission.

The Westfalen Elektricitatswerk has decided to expend £300,000 in the construction of a generating station at Stockum, for the supply of the towns and villages throughout Münsterland, in Westphalia.

The District Council of Münsterberg has resolved to construct departmentally, on communal ground, a large generation station for the supply of 14 districts in the north and west portions of the Government district of Oppeln. The establishment will be, it is stated, the largest of its kind in Prussia, and will work in conjunction with an existing station.

ITALY.—La Società Imprese Idrauliche ed Electtrichi del Tirso has just been formed in Leghorn with a capital of £140,000, to utilise the waters of the River Tirso, on the Island of Sardinia, in the generation of electricity. It is stated that 20,000 H.P. is available.

RUSSIA.—The Council of Ministers has authorised the town of Nijni-Novgorod to raise a loan of about £124,000 for the installation of electric light in the town. The loan is subject to the usual proviso that all orders for material and equipment must be given to Russian firms, unless special authority to purchase outside Russia is obtained from the Ministers of the Interior and of Commerce.—*Board of Trade Journal.*

The Technical Committee appointed by the Senate to consider the question of the exploitation of the waterfalls on the Vuoksa, in Finland, has expressed itself contrary to the grant of the concession to the St. Petersburg Electricity Transmission Co. for the construction, near the village of Kermanpochiya, of a power station of 360,000 H.P., connected by a canal with the Saimensk Lake, for the supply of electricity to St. Petersburg and district.

The Russian Minister of Traffic has completed the preliminaries for a Draft Bill for the utilisation of Russia's water resources. The following definitions and considerations form the basis of the Bill:—The right to utilise the available water resources belongs exclusively to the State, which can either develop them itself or grant concessions for their utilisation. Such a concession can never be apportioned for all time as a private possession, but must be restricted to specified periods, whereby it may be possible to control both the terms under which the utilisation of the water resources will be accorded to private individuals, and also their object. The State's right of inspection is specifically laid down in the Draft Bill.

According to the *Financier*, the St. Petersburg T.C. on May 4th considered the report of the committee chosen to examine the question of the purchase by the Council of the lighting concerns within its area, in connection with the electric lighting of the capital. The conclusions of the committee were that the operations of the lighting companies were far from satisfactory, and were unprofitable to the citizens; that to improve and cheapen the electric light it was necessary for the town to have the lighting in its own hands, to construct its own electric generating station, and to extend the mains along all the streets or purchase the electric concerns now in existence. According to the agreement, the town has the right to take them over in 1917, and this would be necessary, even if for a time an annual payment were made exceeding the net profits received by the town, considering that the chief object of the proposal, as far as the town is concerned, consists in suiting the convenience of the inhabitants as far as possible, and not altogether in extracting profits. The committee advises the Duma to ascertain the revenues of the concerns in order to fix the redemption sum. The Council did not immediately accept the suggestions of the committee, but appointed another committee to further elucidate the situation, and has allocated 10,000 roubles for its use in the inquiry.

HOLLAND.—An electric supply station is to established at Groningen to supply current to the province of Groningen, the northern part of Drenthe and part of Friesland. In order to advertise the scheme, an exhibition showing the applications of electricity to farming and dairying is to be held in August.—*La Gazette de Hollande.*

Crompton.—L.G.B. INQUIRY.—An unopposed inquiry was held on May 28th into the application of the U.D.C. for a loan of £4,012 for a refuse destructor and steam disinfector.

Derby.—PROPOSED LOAN.—The T.C. has applied to the L.G.B. for a loan of £12,550, including £6,000 for mains, £600 for services, £5,000 for motors, £300 for transformers and switchgear, £350 for ash elevator and bunker, and £300 for a motor vehicle.

Dudley.—The B. of G. has retained Mr. E. M. Lacey to report on the electric lighting and heating of the infirmary, and to prepare a scheme.

Durham County.—PROPOSED OVERHEAD WIRES.—The County of Durham E.P.S. Co. has applied to the B. of T. for consent to erect a 20,000-volt overhead line from the sub-station at Hylton to Southwick, through the areas of the Sunderland R.D.C. and the Southwick U.D.C., both of which have consented.

Easington (Co. Durham).—WORKHOUSE LIGHTING.—The B. of G. has decided to install electric light at the Workhouse and Poor Law Offices.

Gillingham (Kent).—PRICE REDUCTION.—As a temporary measure, until a revised list of charges is adopted, the T.C. has decided to reduce the price of electricity for domestic purposes other than lighting from 1d. to ½d. per unit.

Glasgow.—NEW POWER STATION.—The erection of the generating station at Dalmarnock, which will in time supply the whole city, the present stations acting as auxiliaries, has been commenced. The work will be carried through in two sections, the cost of which will be £250,000 each.

Grimsby.—ANNUAL REPORT.—The net profit of the Corporation electricity department for the past year amounted to £4,061, compared with £3,147 in the previous year. The total income was £24,016, against £21,230, and the working expenses totalled £12,896, against £11,441. After meeting various expenditure of a capital nature on plant, amounting to some £3,500, £500 was allocated to rate relief. Of the increased revenue £2,144 was from private consumers, which, the engineer states, is due to canvassing, as the price of current has not been reduced for three years.

Lancaster.—YEAR'S WORKING.—The income of the Corporation electricity department for the past year was £9,185, against £9,217 in the previous year, and the total expenditure was reduced by £42. There was an increase of 12,714 units sold for lighting, and 38,522 for power. The net profit was £349, against £339.

London.—BETHNAL GREEN.—At a meeting of the B.C., last week, the Electricity Committee reported the receipt of a letter from the Association of Consulting Engineers, concerning the proposal of the B.C. to advertise for an engineer for its electricity scheme, and stating that it was against the rules of the Association for members to reply to advertisements. In the circumstances, the Committee again recommended that Mr. J. F. C. Snell be appointed, at a fee of £5 per cent. An amendment that the fee be fixed at £953 was defeated. A letter was then read from Mr. Snell, in which he stated that, after the proceedings at the previous meeting, he declined to act in any way in the matter. In his opinion, the Council's arrangements as to the appointment of an engineer to carry out the scheme would lead to difficulties, and possibly increased expenditure, and he declined to accept any responsibility for the scheme or estimates which he had prepared if the work was carried out by an unqualified man. The letter was referred to the Electricity Committee.

HAMMERSMITH.—The Electricity Committee has recommended the B.C. to supplement the main in Goldhawk Road, at a cost of £1,153.

Manchester. — YEAR'S WORKING. — For the past financial year the Corporation electricity department earned a revenue of £513,589; working expenditure absorbed £276,484; interest, £66,992; debt redemption, £111,764; and £22,343 was transferred to renewals. The net surplus was £36,006, and of this £28,705 was devoted to rate aid. The sales of energy during the year totalled 118 million units.

Monmouth.—L.G.B. INQUIRY.—An inquiry has been held into the application of the T.C. for sanction to borrow £1,800 for electricity mains, &c., which broke down in December last. New cables have been laid, and the application was to cover the expenditure incurred.

Padiham.—The Burnley T.C. has asked the Council if, in the event of Burnley acceding to its request to extend its tramways into the town, it will take a supply of electricity for lighting purposes from the Burnley T.C.

Perth.—STATION LIGHTING.—The Joint Station Committee having experimented with gas in all forms, including high pressure, has decided to install electric lighting throughout the station, including the signals. It is also proposed to introduce E.L. in the post office buildings in High Street.

Rawtenstall. — LOAN SANCTION. — The L.G.B. has sanctioned the borrowing by the T.C. of £9,900, for extensions at the electricity works, and £1,000 for street lighting.

Reigate.—ELECTRICITY IN ROAD MAKING.—The T.C. has offered to supply electricity for power to the Surrey C.C., to be utilised at a local depôt for making bituminous surfaces for roads, at 1½d. per unit on the minimum consumption of 30,000 units per annum for three years.

Southborough. — PROPOSED BULK SUPPLY. — The U.D.C. has appointed a Committee to discuss with the Lighting Committee of the Tunbridge Wells T.C. the question of the supply of electricity in bulk, and is communicating with the Tonbridge U.D.C. on the same matter.

Stalybridge.—PROPOSED NEW STATION.—The Joint Tramways and Electricity Board has decided to apply for powers to erect and equip a new generating station.

Stockton Heath.—PROPOSED E.L.—The Warrington T.C. has intimated that, in the event of powers being obtained, it is prepared to supply electricity in Stockton Heath for lighting purposes upon similar terms to those in force in Warrington, and the P.C. has decided to support any application for powers by the T.C.

Sunderland.—ANNUAL REPORT.—The report of Mr. Blackman, the borough electrical engineer, for the year ended March 31st, 1914, shows that the total sales amounted to 14,870,527 units, including 9,727,844 for power, 1,839,420 for lighting and heating, 816,787 for small motors, 682,257 for public lighting, and 1,804,219 for traction. The works cost per unit was '37d., a reduction of '03d. on the previous year, and the total cost '97d. per unit, a reduction of '1d. The total income was £73,518, and the expenditure £36,221; £10,739 was paid for interest on loans, £15,800 for the repayment of loans, and £9,011 has been carried to the renewals fund. The maximum load was 6,700 KW., and the load factor 25 per cent. Capital expenditure now approximates £40 per KW.

Swinton (Lancs.).—All the machinery in the new works which are being built by Messrs. Gerrard & Sons, builders, is to be electrically driven.

Swinton (Yorks.).—Last week a mishap occurred at the works of Messrs. Hattersley, stove grate makers, of Swinton, involving a stoppage of the plant which was driven by steam power, and work was suspended. The firm, however, arranged with the Mexboro' and Swinton Tramways Co. to connect the works with the tramway system and install a large electric motor, and work was resumed after only one or two days' stoppage.

Todmorden.—PROPOSED LOAN.—The Electricity Committee has decided to apply to the L.G.B. for sanction to the borrowing of £1,000 for mains, and £200 for meters.

Torpoint.—E.L. SCHEME ABANDONED.—A poll of the ratepayers on the question of using electricity or gas for street lighting resulted in a majority of 55 for electric lighting. The Council had sealed an agreement with an E.L. Co. which was being promoted, but as sufficient support was not forthcoming, the company last week decided not to proceed to allotment.

West Bromwich.—YEAR'S WORKING.—The total income of the Corporation electricity undertaking for the past year was £18,313, an increase of £650 compared with the previous year. The total expenditure was £12,518, an increase of £298. The net profit was £29.

Worcester.—YEAR'S WORKING.—The income of the Corporation electricity department for the past year amounted to £21,523, compared with £19,418 in the previous year. The gross profit was £10,879. After paying £3,640 for interest, and £6,777 for reduction of capital, there was a net profit of £463, which has been appropriated for further improvements in connection with the undertaking, the total cost of which was £968, and there was therefore a deficiency of £535 on the year's working. Altogether 432,745 additional units were sold, including 33,289 for lighting, and 388,811 for power and heating. The total costs per unit was '930d., compared with '941d. for the previous year.

TRAMWAY and RAILWAY NOTES.

Accrington.—WORKMEN'S FARES.—The Tramways Committee has decided to issue double workmen's tickets, which enable passengers to travel to and from work twice, at a charge of 2d. Bundles of 1d. tickets are to be issued at seven for 6d.

Argentina.—SUBWAY PROJECTS.—Two directors of the Lacroze Tramways Co., Drs. Miguel and Teofilo Lacroze, left on April 10th on a visit to Europe and America to study the underground railways and electric tramways systems, in connection with the proposals of the Lacroze Co. to extend its system. A short stay will be made in London, in order to study the financial side of the subject, and a visit will be paid to the Panama Exposition, at San Francisco, where the exhibits will represent the last word in tramway construction. The directors will return to Buenos Ayres towards the end of 1915, when the extensions will be commenced.—*Financial News.*

The Government has ordered civil proceedings to be instituted against the Port and City of Buenos Ayres Tramways Co. for the recovery of $232,749 m/n., which is claimed for paving dues.—*Review of the River Plate.*

Asiatic Turkey.—La Societe des Tramways de Smyrne has secured a concession for the supply of electricity in the town of Smyrna, and has also obtained sanction to convert its tramways to electric traction.

Bingley.—TRAMWAY EXTENSION.—The D.C. has decided to apply to the B. of T. for powers to borrow £10,000 for the completion of the tramway extension from Nab Wood to Bingley, on which £26,000 has already been spent.

Burnley.—PROPOSED EXTENSIONS.—The T.C. is to seek powers for several tramway extensions, including a link with the Rawtenstall Corporation tramway at Loveclough, a distance of nearly 3 miles, and until this is constructed, a railless trolley or motor-'bus service will be installed. A report is to be obtained on advisability of running motor-'buses generally throughout the borough.

Canada.—NOVA SCOTIA.—A Bill has been introduced to incorporate the Nova Scotia Tramways and Power Co. The directors are largely the same as those of the Halifax Electric Tramway Co. The capital is to be $5,000,000, with powers to increase it to $10,000,000, and there is to be an authorised bond issue of $9,000,000. The measure authorises the new company to purchase the Halifax Electric Tramway Co.

Colne.—The T.C. has approved a scheme for the repainting and rebuilding of the whole of its tramway cars, at a cost of £2,414.

Continental Notes.—GERMANY.—The trials of multiple-unit trains on the Silesian mountain railways have proved very satisfactory, and the service is to be extended to Fellshammer, and shortly to the Austrian frontier, at Halbstadt, a total distance of 35 km. The full electrical service will be put into operation before the end of the year, and the working of through trains by locomotives will commence during this summer. To the existing motor-generator station at Nieder-Salzbrunn will be added others at Ruhbank, Hirschberg and Lauban. The power station is in Mittelsteine.

A light electric railway from Neunkirchen (near Saarbrücken) to Spiesen and Elversberg is to be commenced forthwith, and completed before the winter.

ITALY.—A company has been formed at Bologna, under the style of the Societa Anonima Elletrovie Emiliane, with a capital of 1,500,000 lire, for taking over and working concessions for electric railways and tramways.

Terms have been agreed upon between the Government and the Subconcessionary Co. constructing the Ambertide-Todi-Terni railway and the branch to Ponte S. Giovanni Perugia for the conversion of the system to electric traction. Instead of a subsidy of 7,500 lire per km. for 70 years, the Government is to pay 10,000 lire for 50 years, and to accept 15, instead of 20 per cent. of the profits. These modifications are induced by the special importance of the projected lines, and the advantages accruing to the public from their electrification.

La Societa Filovie di Cuneo has secured a concession for the construction of a narrow-gauge electric railway, about nine miles long, between Cuneo, Peveragno and Chiusa.

Coventry.—ANNUAL ACCOUNTS.—The accounts of the T.C. tramways department for the year ended March 31st, 1914, show that the total revenue was £43,484, against £39,153 for the previous year. The car-mileage run was 1,125,705, against 994,207. Working expenses amounted to £29,116, against £24,118. The net profit was £696, which has been carried forward. The total receipts per car-mile were 9·271d., as compared with 9·451d. in the previous year. Six motor-omnibuses have been introduced to provide transit facilities to those districts not served by tramways.

Glasgow.—YEAR'S WORKING.—The working of the Corporation tramways department for the year ending May 31st, 1914, resulted in a total revenue of £1,078,691, an increase of £71,038 on the previous year. The car-miles run were 24,403,482, an increase of 1,068,474, and the passengers carried numbered 336,654,624, an increase of 25,174,538. Traffic receipts per car-mile worked out at 10·609d., an increase of ·245d., and receipts per passenger at ·769d., a decrease of ·007d.; 211 million passengers were carried at ½d. fares.

Huddersfield.—EXTENSIONS APPROVED.—The Corporation's tramway extension from Elland to West Vale was inspected and improved by Col. Druitt, B. of T. Inspector, on Friday last.

Hull.—YEAR'S WORKING.—The net revenue of the Corporation tramways department for the past financial year was £33,571, and the net profit £14,526, an increase of £1,091. The passengers carried numbered 45,679,094. The traffic revenue was £165,893, and the working expenses £117,795. The reserve fund now stands at £136,304.

Keighley.—YEAR'S WORKING.—During the year ended March 31st last, the tramways carried 3,606,218 passengers, and the cars ran 241,917 miles; the motor-'buses carried 402,158 passengers and ran 64,742 miles, and railless traction vehicles carried 98,264 passengers and ran 17,114 miles. There was a surplus of £450 on the tramways and £284 on the railless traction, and these amounts were transferred towards meeting a deficiency of £964 on the motor-omnibus account. The T.C. hopes that the railless traction systems to Oakworth and Eastburn will be ready in a month or two, and the Tramways Committee apparently wishes to get rid of the motor-'buses altogether; one speaker said they had cost the town upwards of £10,000.

Lancaster.—YEAR'S WORKING.—The traffic revenue of the Corporation tramways department for the past year was £5,779, against £5,437 in the previous year. The net deficit, after paying interest and redemption, was £1,928, against £2,254.

London.—ELECTRIC VEHICLES.—We are informed that there were 13 electric vehicles in the commercial motor parade on Monday last. All of these were fitted with Edison batteries.

L.C.C.—The Tramways Conciliation Board has issued its award in connection with the demands of the employés of the tramways department of the L.C.C. The hours of labour of the men on shift duty at the generating station are to be reduced to 52 per week as from June 1st, 1914, and concessions have been granted to the permanent way staff. The cost of the award to the Council is estimated at £5,600 per annum, and no further applications for increased pay are to be considered for two years.

Stainland.—PROPOSED TRAMWAY EXTENSIONS.—The U.D.C. has decided to ask the Huddersfield T.C. to extend its tramway system from West Vale to Stainland, thus making a circular route.

Stalybridge.—The 1d. minimum fares on the tramways of the Joint Board have so far resulted in increased receipts but fewer passengers, compared with the figures for last year. The receipts during the eight weeks since the system was adopted increased by £313, while the decrease in the number of passengers was 70,849.

Sunderland.—ANNUAL REPORT.—The total revenue of the Corporation tramways department for the year ended March 31st last was £75,226, as against £68,507 in 1913. The passengers carried numbered 18,475,671, as against 16,972,537. The working expenses were £42,661, or 6·805d. per car-mile, as compared with 6·334d. in the previous year. The net revenue was £32,565, of which £6,837 is absorbed by interest on capital, and £9,948 by repayment of loans; £9,718 has been placed to the renewals fund and £5,000 in aid of the rates. The reserve and renewal fund now stands at £39,508. During the year 500 rail joints were cut and inserts electrically welded by the Tudor Co., and 250 joints were dealt with by oxy-acetylene welding.

West Bromwich.—The General Purposes Committee of the T.C. has considered the question of transit between the centre of the town and the outlying districts, and has now issued a report advocating the introduction of motor-'bus services. The principal reason which induced the Committee to come to this decision was that the capital cost of four motor-omnibuses and garage would be about £4,000, as compared with £10,514 for trolley vehicles. It is estimated that there will be a deficiency on the undertaking of £640 per annum, to be met out of the borough fund.

YEAR'S WORKING.—The net profit on the past year on the Corporation tramway undertaking was £261, which has been carried forward.

TELEGRAPH and TELEPHONE NOTES.

China.—It is announced from Peking that preparations have been started for the establishment of four wireless telegraph stations in China, at Peking, Hankow, Shanghai, and Chefoo. It is also reported to be the intention to establish similar stations at Canton and Chengtu.

German Trans-Atlantic Wireless Telegraphy.—The Compagnie Universelle de Télégraphie et Téléphonie sans Fil, of Paris, whose shares are held mostly by the English Marconi Co., has acquired the foreign (extra German) Goldschmidt patents from the Hochfrequenzmaschinen-A.G., together with an option on the Eilvese station near Hanover. It also bought the Tuckerton station in America, which was built to communicate with Eilvese. The German Telefunken Co. has now bought from the above French company the option on the Eilvese plant in order to secure an influence on the trans-Atlantic communication with Tuckerton. If this option is exercised the Telefunken Co. and the Hochfrequenzmaschinen-A.G. Co. will form a joint operating concern, but it is not yet decided which system will be adopted for working.

Portsmouth.—The transfer of the Corporation telephone system to the Post Office, comprising 10 exchanges and 2,000 subscribers, has been completed, the price paid being £30,000.

South Africa.—Attention has been called in the Union Parliament to the grievances of telegraph servants, the grounds for dissatisfaction being questions of salary, promotion, leave, &c., but principally the trouble would seem to be that the department is grossly understaffed. Johannesburg is the busiest telegraphic centre in the Union, and understaffing, especially at transmitting centres, is chronically in evidence; complaints have been made regarding delays which could easily be avoided were the stations properly staffed. It appears that fully-qualified operators have not been drafted into offices when necessary, but only juniors, who are not capable of taking on the responsibilities of qualified operators, and the result has been a burden upon the shoulders of the capable men.

Television.—Last week, in the course of a lecture before the Institute of Automobile Engineers, Dr. A. M. Low exhibited an apparatus for seeing at a distance by electric transmission. The apparatus was in somewhat crude form, but is stated to have reproduced a picture more or less successfully. The principle employed is well known; the picture is projected upon a screen of small selenium cells, which are successively and very rapidly connected by line wires to a corresponding series of receivers, persistence of vision being relied upon to give the effect of simultaneous reproduction. The image consists of a pattern of small squares, and necessarily flickers. The inventor admitted that the experiment was expensive, and that the invention was not yet commercially practicable. The method is known to be feasible in theory, but there are great difficulties, not least of which is the heavy cost, in the way of its practical development.

The Telephone Service.—It is reported that the telephone authorities in London are about to install a small number of meters in subscribers' offices, to register the number of calls made, with a view to ascertaining whether the apparatus are satisfactory in service and whether they are likely to solve the difficulty often experienced when subscribers dispute the accuracy of the records made by the exchange operators.

A correspondent of the *Financial News* has discovered that a telephone subscriber who has several lines can call up two other subscribers, connect their lines, and listen to the subsequent argument as to why they called each other up. He sees in this possibilities of fraudulent practices; the Post Office, he says, is also concerned, mainly because a subscriber who is on the "unlimited-service" tariff can put through a "message-rate" subscriber to other subscribers without the calls being metered at the exchange.

West Indies.—Arrangements are being made for the reduction of cable rates between the West Indies and Great Britain and Canada, by the payment of a subsidy of £16,000 a year by the British and Canadian Governments to the West India and Panama Telegraph Co., Ltd., in addition to the £10,800 a year paid by the Colonial Governments. The rates will be 2s. 6d. to this country, and 1s. 6d. to the first zone of North America; and half these rates for deferred telegrams in plain language.

Wireless on Board Ship.—The text of the Bill introduced into Parliament to give effect to the International Convention for the Safety of Life at Sea, which was signed in London on January 20th, was published last week. The Bill provides for British participation in the establishment and maintenance of a patrol service in the North Atlantic, and enjoins ships that receive a wireless distress signal to proceed at once to the rescue of those in distress. Every British ship which carries 50 or more persons is to be provided with a wireless installation.

CONTRACTS OPEN and CLOSED.

OPEN.

Aberdeen.—Corporation. Electric lighting and heating work for the additions to Police offices. Mr. John Rust, City Architect, 224, Union Street.

Australia.—SYDNEY.—July 20th. Box compound, meters, maximum-demand indicators, arc lamp carbons, and straight-stem insulators, for the Council. Specifications for each section 10s. 6d., from City Electrical Engineer, Town Hall.

July 8th. N.S.W. Railways and Tramways Department. One battery booster set to Specification No. 453. Specification (2s. 6d.) from the Electrical Engineer's Office, 61, Hunter Street, Sydney.

HOBART.—July 20th. Telegraph and telephone material, for Postmaster-General. See "Official Notices" to-day.

PERTH.—July 22nd. Telegraph and telephone material, for Postmaster-General. See "Official Notices" to-day.

August 5th. Copper wire and binders, for Postmaster-General. See "Official Notices" to-day.

August 12th. Cable, lead-covered and various, for Postmaster-General. See "Official Notices" to-day.

MELBOURNE.—July 28th. Testing apparatus for the P.M.G. See "Official Notices" to-day.

July 6th. Rotary converters and frequency changes, for Melbourne Suburban Railways. See "Official Notices" to-day.

Austria.—VIENNA.—June 15th. Supply of a year's requirements of carbons and glow lamps. Particulars and forms from the k.k. Staatsbahndirection Vienna (enclosing postage).

PILSEN.—June 15th. The State Railway Direction at Pilsen invite tenders for a quantity of machinery, including a 10,000-kg. travelling crane, with rails, a rotary current dynamo, an exciter, a motor dynamo (rotary and constant current), sundry fittings for a high-pressure station, a switchboard, leads, &c. Particulars from Alterlung IV., der Staatsbahndirection, Pilsen (enclosing postage)

SZIGETVAR.—June 15th. Concession for the erection of an electric installation and public and private supply of current for lighting and power purposes. Deposit, 5 per cent. Particulars of the Gemeindevorstehung or Vikhor Martos, E.E., 30, Erzsebetkorut (enclosing 30 kronen), Budapest.

GORLIC.—June 20th. Concession for electric lighting, the Commune providing the ground. Particulars of the Magistratsbureau, Gorlic, Austria-Hungary.

Barrow-in-Furness.—June 8th. 6,000 tons of coal for the Electricity Department. Forms of tender from the Town Clerk.

Belgium.—June 13th. The municipal authorities of Lokeren. Concession for the supply of electrical energy for lighting and power purposes in the town.

The authorities of the Fonderie Royale des Canons, in Liége (80, Quai St. Leonard). Supply and installation of the plant and apparatus for the distribution of electrical energy for lighting and power purposes in the various buildings at the military camp at Brasschaet.

Bootle.—June 9th. 5,000 tons of slack, 2,000 tons of steam coal, and 1,000 tons of nuts, for Pine Grove and Marsh Lane electric light stations. Electricity Works Office, Pine Grove.

Canada.—June 12th. For the Winnipeg Municipality. 5,500 ft. of three-core paper-insulated lead-covered 13,000-volt cable. Specifications from the Light and Power Department, 54, King Street, Winnipeg.—*Canadian Engineer.*

Chelmsford.—Refuse destructor for the T.C. Borough Engineer.

Colne.—Workshops for the Corporation Electricity Department. Borough Surveyor.

Dartford.—June 15th. U.D.C. One 500-KW. high-pressure steam turbine, generator, condenser, &c. See "Official Notices" May 22nd.

June 17th. Installation of telephones and domestic bells, &c., at Orchard Hospital, for Metropolitan Asylums Board. See "Official Notices" to-day.

Dublin.—June 25th. Corporation. Feed pump, tanks, pipework, &c. See "Official Notices" to-day.

Eccles.—June 22nd. 5,000 tons of slack for the Electricity Department. Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft.

Erith.—June 8th. 8,000 tons of coal for the Electricity Department. Forms of tender from the Clerk to the U.D.C.

France.—June 13th. The Prefectural authorities of the Seine Department in Paris (Tribunal de Commerce) are inviting tenders for an installation of electric lighting in the tunnel portion of the St. Martin Canal below the Boulevard Richard Lenoir and the Place de la Bastille.

Harrogate.—June 22nd. Corporation. Economiser, 288 pipes, for Electricity Department. See "Official Notices" May 29th.

Hungary.—June 20th. The municipal authorities of Gorlic. For the concession for the establishment of a central electric lighting station in the town on land belonging to the municipality.

Leeds.—June 29th. Corporation. Air-cooled transformers. See "Official Notices" May 22nd.

London.—L.C.C.—June 23rd. 50, 100 or 150 complete trailer-cars, and equipment of 200 existing electric motor-cars with couplers and traction gear for drawing trailer-cars. See "Official Notices" May 29th.

BATTERSEA.—June 24th. B.C. Coal telpherage plant. See "Official Notices" May 29th.

HAMPSTEAD.—June 11th. B.C. One 1,500-KW. turbo-alternator, barometric jet condenser and pipework, cooling tower and tanks. See "Official Notices" May 22nd.

STEPNEY.—June 11th. B.C. Three years' supply of meters, demand indicators, time switches and carbons. See "Official Notices" May 22nd.

ST. PANCRAS.—June 25th. B.C. Large water-tube boilers. See "Official Notices" to-day.

Manchester.—June 10th. The Education Committee is inviting tenders for a complete electric lighting installation at Soss Moss Special School. Specifications, &c., £1 1s. (returnable) from the Education Offices, Deansgate.

Merthyr Tydfil.—June 8th. Steam boiler and electric motor for Mardy Isolation Hospital laundry, for the T.C. Borough Engineer.

Morecambe.—June 25th. Corporation. 2,500 tons of coal or slack, for the Electricity Supply Department. See "Official Notices" May 29th.

New Zealand.—WELLINGTON.—July 9th. City Council. Electric chassis for a 2,000-lb. parcel delivery van, and an electric car, for the Electric Tramway Department. Specification may be seen at the Board of Trade Commercial Intelligence Department in London.

July 27th.—New Plymouth B.C. (2) Overhead wiring and permanent way (5 route miles). (3) Sub-station equipment (converting plant, battery, booster, switchboard, &c.). (4) Rolling stock (six complete cars) for electric tramways. Specifications from Mr. F. Black, Consulting Engineer, Wellington, or B. of T. Offices, London. Deposit (2) £4 4s.; (3) £2 2s.; (4) £2 2s.—*N. Z. Shipping and Commerce.*

AUCKLAND.—August 6th. Three 750-KW. D.C. mixed-pressure turbo-generators; one 1,500-KW. three-phase turbo-generator, including auxiliary plant and sub-station equipment. See "Official Notices" May 22nd.

Salford.—June 15th. 24 car bodies, also trucks, motors, controllers, &c., for same. General Manager, Corporation Tramways, 32, Blackfriars Street.

Sherburn Hill (Co. Durham).—E.L. installation, Primitive Methodist Church, for the Trustees.

South Africa.—WORCESTER, CAPE PROVINCE.—July 15th. According to a notice in the *African World*, the Municipal Council invites tenders for electricity supply works as follows:—Buildings; two 60-H.P. turbo-generators (water), 70-H.P. crude-oil engine set, booster, &c.; switchboard; storage battery; transmission lines; network and street lighting; electricity meters and house wiring. Specifications, &c., from Prof. Bohle, 25, Rosmead Avenue, Cape Town, or the Town Clerk; deposit, £2 2s.

Stockton-on-Tees.—June 12th. Corporation. Supply of E.H.T. lead-covered paper cables. See "Official Notices" to-day.

Sutton Coldfield.—12 months' supply of steam slack coal for the Electricity Department. Forms of tender from the Engineer, Riland Road.

Swansea.—June 25th. Corporation. Main generating station and sub-station. Extra H.T. and L.T. switchgear. See "Official Notices" to-day.

Wallasey.—June 6th. Steel-framed buildings for the generating station in Dock Road, Poulton. Drawings, &c., £2 2s., obtainable from Mr. J. A. Crowther, Borough Electrical Engineer, Seaview Road.

Walthamstow.—June 12th. U.D.C. E.H.T. cable and stoneware conduits. See "Official Notices" to-day.

Wimbledon.—12 months' supply of coal for the E.L. Committee.

Winchester.—June 8th. 12 months' supply of small steam coal for the Electricity Department. Forms of tender from the City Electrical Engineer, Gordon Road.

Wrexham.—The Borough Electrical Engineer has been instructed to prepare a specification and invite tenders for a 300-KW. set including condenser.

CLOSED.

Belgium.—La Société de l'Electricité de l'Est de la Belgique, of Verviers, has secured the concession for the supply of electrical energy for lighting and power purposes in the little town of Olne (Province of Liége).

Bolton. — The Electricity Committee has accepted the following tenders in connection with the Back-o'-th'-Bank Station:—

Chadburn's Ship Telegraph Co., Ltd.—Signalling gear.
Herbert Morris, Ltd.—Workshop crane.

Canada.—Messrs. Babcock & Wilcox, Ltd., have received a contract, at $183,800, for the complete equipment of the new boiler house at the Edmonton electricity works.—*Canadian Engineer.*

Derby. — The T.C. has accepted the following tenders:—

Edison Electric Co., Ltd.—Motor tower wagon, £680.
British Thomson-Houston Co., Ltd.—Switchboard instruments, £328.

The E.L. Committee has accepted the tenders of Messrs. Parr and Son, Mr. Thos. Walker, the Derby Coal Co., Ltd., and the Derby Kilburn Colliery Co., Ltd., for coal, for the electricity works.

Edinburgh.—Messrs. Grindlay, Ross & Co., of Glasgow, have received the contract for the installation of electric light at Pierhill Barracks.

Falkirk.—Messrs. Chamberlain & Hookham, Ltd., have received the contract for D.C. meters for the coming year.

Gillingham.—The tender of the Electrical Co., Ltd., has been accepted by the Town Council, at £67, for the installation of transformers.

Glasgow.—The T.C. has accepted the tender of Messrs. Johnston, Park & Co. for re-wiring the sewage disposal works, at £125.

Hastings.—The Borough Education Committee has accepted the tender of Mr. G. Tester, of Hastings, for installing the E.L. at three schools, at £81.

Hindley.—The U.D.C. has awarded a contract for low-tension cable and joint-boxes and feeder-pillars to the B.I. & Helsby Cables, Ltd.

Hull.—The Property Committee of the T.C. has decided not to comply with the request of the T C. that tenders be advertised for, for the supply of electrical fittings for the new Council Chamber. At the meeting at which this decision was arrived at, the architect (Mr. E. Cooper) said that it would be difficult to obtain competitive prices, as the estimate had been based on Mr. Smith's prices, after working out the designs in consultation with himself. It was decided to accept Mr. Smith's prices.

Ilford.—The following tenders have been accepted by the U.D.C. :—

Pritchetts & Gold, Ltd.—Two storage batteries, £1,580, and maintenance for 10 years, £115 per annum.
Mawdsley's, Ltd.—Battery booster set, £161.
Bertram Thomas.—Two automatic battery regulating switches, £57 each.

The electrical engineer has had under consideration the question of fitting mechanical stokers or other smoke-consuming devices to the boilers at the electrical works which are not already fitted, and in accordance with his suggestion, the U.D.C. has decided to accept the offer of the Boiler Air Bridges, Ltd., to fit No. 1 boiler on trial with their apparatus. The name of the Electrical Apparatus Co. is to be added to the Council's list of contractors for the supply of meters.

Leyton.—The U.D.C. has entered into contracts with Messrs. Venner & Co., the Electrical Apparatus Co., Ltd., and the British Thomson-Houston Co., Ltd., for an annual supply of ordinary meters. Also with Messrs. Venner & Co., and the B.I. and Helsby Cables, Ltd., for a similar supply of slot meters. The tender of Messrs. Lewis & Son, at £45, has also been accepted for the supply of a new set of pipes for No. 3 boiler at the electricity works.

London.—KENSINGTON.—The B. of G. has awarded the contract for wiring the Infirmary to Messrs. Lund Bros. & Co., at £1,783.

G.P.O.—The tender of Messrs. G. E. Taylor & Co. has been accepted for electric lighting at the N.W. District Post Office.

SOUTHWARK.—The B.C. has received the following tenders for '5 by '5 by '5 and '3 by '3 cable :—

	£	s	d
British Aluminium Co.	223	0	0
Connolly Bros.	190	0	0
Macintosh Cable Co.	188	9	10
Callender's Cable and Construction Co.	179	9	0
W. T. Glover & Co.	176	10	0
W. T. Henley's Telegraph Works Co.	176	5	0
General Electric Co.	175	15	0
Pirelli, Ltd.	175	15	0
Johnson & Phillips, Ltd.	173	0	0
Union Cable Co.	173	0	0
British Insulated and Helsby Cables, Ltd.	172	15	0
Western Electric Co.	171	7	6
Siemens Bros. & Co.	169	1	0
H. W. Butler & Co (agent)	164	11	8
Electrical Engineering and Equipment Co. (recommended)	163	2	6

Councillor Abbott proposed that the tender of Messrs. Siemens Bros. & Co., Ltd., be accepted, at £169. He said that the latter firm manufactured the cable in this country, and, therefore, paid Trade Union wages and observed Trade Union conditions. The Council would be able to ascertain whether those clauses in the contract were carried out. In the case of the Electrical Engineering Co., they could not supervise that, as the cable would be made abroad. Councillor Bird seconded. Alderman Boyd said that Messrs. Siemens had larger works abroad than they had in this country. Councillor Ward said that the firm recommended for acceptance was a Swiss firm, and they had ascertained that their hours of labour and rate of pay were equal to those of any firm in England. The wages involved amounted to only £20 in the contract, and the question merely was whether this small sum should be paid in wages in this country or on the Continent. The amendment was defeated by 28 votes to 25, and the recommendation was approved.

The tender of the General Electric Co., Ltd., for the supply of all types of Osram lamps has been accepted by the Comptroller of Stores, G.P.O., Bedford Street, London, W.C.

Manchester.—The tender of Messrs. Spagnoletti, Ltd., has been accepted by the Corporation for electrical equipment at the head post office.

Merthyr Tydfil.—The question of rejecting the lowest tender, that of the South Wales Accessories Co., at £303, for E.L. work at the Poor Law Institution at Aberdare, referred to in the ELECTRICAL REVIEW on May 22nd, was discussed by the B. of G. at its last meeting. In the absence of the clerk and several members, who were transacting business in another room, a motion was carried to the effect that a special meeting should be held to reconsider the tenders, owing to the public controversy raised. On the clerk's return to the room, he said that the accepted contract was ready for sealing, and he advised the board to accept the tender already decided upon, as it was perfectly justifiable to do so. In the end the contract was sealed, and the special meeting decided upon abandoned.

Nuneaton.—The T.C. has accepted the offer of Messrs. Willans & Robinson, Ltd., to fit a "claw" type coupling on the 500-KW. turbo-generator.

Sunderland.—The Corporation Tramways Committee has accepted the tender of the North-Eastern Steel Co. for 50 tons of new rails. Two English, two German and one American firm competed. The lowest tender was German.

United States.—Messrs. the B.I. and Helsby Cables, Ltd., have received an order from the Edison Electric Illuminating Co., of Boston, for 55,000 ft. of three-phase, 25,000-volt cable This is stated to be the first order for British cable for the United States, and it is also to be laid under the supervision of the British company.—*Canadian Engineer.*

Warrington.—Messrs. Johnson & Phillips, Ltd., have received from the Corporation a contract for E.H.T. and medium tension cable.

West Bromwich.—The T.C. Highways Committee recommends the acceptance of the tender of Messrs. G. L. Wells, Ltd., for four motor-omnibuses, and the tender of Mr. G. Jones for the erection of a motor garage on land of the Corporation at Cronehills, the latter being estimated to cost about £1,000, including heating, lighting and equipment.

Wimbledon.—The T.C. has recommended for acceptance the offer of Messrs. E. Bennis & Co., Ltd., at £408, for the supply of two of their chain grate mechanical stokers.

FORTHCOMING EVENTS.

Royal Institution of Great Britain.—Friday, June 5th. At 9 p.m. At Albemarle Street, W. Paper on "X-rays and Crystalline Structure," by Prof. W. H. Bragg, F.R.S.

Thursday, June 11th. At 3 p.m. Lecture (II) on "Faraday and the Foundation of Electrical Engineering," by Prof. Silvanus P. Thompson, F.R.S.

Institution of Electrical Engineers (Scottish Local Section).—Tuesday, June 9th. Excursion to Arran.

Rontgen Society.—Tuesday, June 9th. At 8.15 p.m. At Institution of of Electrical Engineers, Victoria Embankment, W.C. Annual General Meeting, Exhibition and Lantern Demonstration.

Faraday Society.—Thursday, June 11th. At 8 p.m. At Institution of Electrical Engineers. Presidential address on "Advances in the Metallurgy of Iron and Steel," by Sir Robert Hadfield, F.R.S.

Physical Society of London.—Friday, June 12th. At 8 p.m. At Imperial College of Science, South Kensington, S.W. Papers on "A Magnetograph for Measuring Variations in the Horizontal Intensity of the Earth's Magnetic Field," by Mr. F. E. Smith. "The Atomic Weight of Copper by Electrolysis," by Mr. A. G. Shrimpton. "An Improvement in the Einthoven String Galvanometer," by Mr. W. H. Apthorpe.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued:—

Friday, June 5th.—"D" Company. Infantry drill, 7 to 8.30 p.m. Technical instruction, 8.45 to 10 p.m. Miniature range instruction, 8.45 to 10 p.m.

Saturday, June 6th.—Headquarters will be opened for regimental business from 10 a.m. till 12 noon.

Monday, June 8th.—"A" Company. Infantry drill, 7 to 8 p.m. Technical instruction, 9 to 10 p.m. Miniature range instruction, 9 to 10 p.m.

Wednesday, June 10th.—All Companies. Rating examination, 7 to 10 p.m.

Thursday, June 11th.—"C" Company. Infantry drill, 7 to 8.30 p.m. Technical instruction, 8.45 to 10 p.m. Miniature range instruction, 8 to 9 p.m.

Friday, June 12th.—"D" Company. Infantry drill, 7 to 8.30 p.m. Technical instruction, 8.15 to 10 p.m. Miniature range instruction, 8.15 to 10 p.m.

Saturday, June 13th.—All Companies. Annual course of musketry at Purfleet rifle ranges. Headquarters will be opened for regimental business from 10 a.m. till 12 noon.

(Signed) F. R. HOLT-WHITE, Capt. R.E., Adjutant,
For Officer commanding L.E.E.

NOTES.

Engineering Trades and a 48-Hour Week.—The *Financial Times* states that the adjourned conference between the Engineering Employers' Association and representatives of the Unions affiliated to the Engineering and Shipbuilding Federation, on the demand of the latter for a 48-hour working week, was resumed in London on May 26th.

At the previous sitting the Employers' Council asked the Unions for a guarantee that, in the event of them agreeing to a reduction of working hours to 48 weekly, the output per week would not be reduced. The Federation representatives stated last week that they were unable to give any guarantee, but they believed that, by better time-keeping and other economies, the reduction in output would be kept at a minimum. Under these circumstances no decision was arrived at, and the matter was referred back to the whole of the members of the Employers' Association for their opinion. It is considered unlikely that they will accede to the demand, in which case a serious situation may possibly arise.

Institution and Lecture Notes.—The Electrical Association of New South Wales.—This Association held a dinner at Sydney, on April 24th, to celebrate the twenty-third year of its existence. Dr. J. F. V. Madsen, of Sydney University, presided over a large attendance, and in the course of his speech said that in New South Wales the greater part of the electrical development had been confined to the Sydney area. Victoria, on the other hand, had seen development in electric lighting in the small centres, and New South Wales had much to make up in this direction. This state of affairs was largely due to the law.

In the course of a lecture before the Irish Technical Congress in Killarney, on May 26th, Mr. J. F. Crowley, of Messrs. Siemens Bros. Dynamo Works, Ltd., described the evolution of the modern system of driving textile machines by separate small motors, which has resulted in an increase of production amounting in some cases to as much as 20 per cent. The electrical Jacquard also is making good progress, and the introduction of special glass has enabled the effect of normal and unvarying daylight to be obtained with incandescent electric lamps, so that colours can be matched with precision.

Institution of Electrical Engineers. — A party of the Yorkshire Section visited Hull on May 20th as the guests of Mr. H. Bell, the city electrical engineer. A visit was paid to the deep-water docks, and afterwards the party was shown over the electricity works at Sculcoates. In the evening a dinner took place at the Grosvenor Hotel.

Victorian Institute of Electrical Engineers.—At the meeting held on April 30th, Mr. E. H. W. Westwood read a paper on "Electric Searchlights in Theory and Practice, and their Applications." The report of the Council for 1913 shows the total membership as 189, and the average attendances at meetings have been 36·6 members and 12·1 visitors per meeting.

Institution of Electrical Engineers.—The *Journal* for June 1st contains the result of the Associate Membership Examination held in May; only seven candidates' names appear in the pass list, though it was announced in the Annual Report that 112 had been approved by the Council for admission subject to their passing the examination or otherwise satisfying the examination regulations. The number of candidates who sat for examination, unfortunately, is not stated, and it may be that many of the 112 were exempt from examination owing to their possession of recognised qualifications. The examiners were:—English Essay, Mr. C. C. Hawkins; Translation from French, Dr. H. Borns: Applied Mechanics and Physics, Prof. A. W. Porter; Chemistry, Prof. H. Jackson; Electricity Supply, and Electric Lighting and Power, Mr. J. F. C. Snell; Electric Traction, Mr. Roger T. Smith; Telegraphy, Major W. A. J. O'Meara; Manufacture of Electrical Machinery, Mr. M. B. Field; Design of Electrical Machinery and Apparatus, Mr. J. S. Peck.

The report of the Committee of the Newcastle Local Section, presented at the meeting on May 25th, shows a total membership of 303, or four less than in the previous year. An Entertainment Guarantee Fund has been formed to adjust the balances of social events controlled by the Committee. Arrangements are in hand for a Summer Outing on July 18th. The Students' Section possesses 76 members. The principal officers elected for the next session are as follows:—Chairman, Mr. P. V. Hunter; vice-chairmen, Messrs. H. W. Clothier and A. H Marshall; hon. treasurer, Mr. C. Vernier; hon. secretary, Mr. J. R. Andrews. Mr. L. E. Mold is chairman, and Mr. R. C. Phillip hon. secretary of the Students' Section Committee.

Fatalities.—Circumstances attending a narrow escape from a serious tramway accident at Middlesbrough were related at an inquest on May 28th, held on a tramcar driver named John William Atkinson, aged 59. Wilfred Alderson, the conductor of the car driven by Atkinson, said that on May 9th he noticed that the latter was behaving rather strangely. At several stopping places Atkinson failed to pull up his car, and even when witness rang the bell the driver did not obey. Shortly after 9 p.m. the driver ran through the Devonshire Road loop instead of stopping, although another car was approaching on the single line. Witness pulled out the back switch to avoid an accident, and the driver of the approaching car reversed his motors, and when Atkinson's car was stopped only two yards separated the two vehicles. Witness found Atkinson in a semi-conscious state. He complained that he had had a shock. Dr. Mather said Atkinson bore no signs of electric shock. A post-mortem showed that death was due to cerebral hemorrhage, which was not traceable to electric shock. A sudden attack of hemorrhage would cause collapse and paralysis, similar to that produced by shock. A verdict of "Death from natural causes" was returned. Mr. Freshwater, the general manager of the Imperial Tramways Co., said he would see that Alderson and Braithwaite (the driver of the approaching car) received some reward for their prompt action.

A St. Petersburg dispatch to the *Daily Express* says that two soldiers were killed and three others were paralysed on May 28th by a curious accident at the military baths at Czaritzin. Some of the men who were bathing had slung their clothing across an electric light wire, which gave way, the broken end striking a group of soldiers.

Our Cape Town correspondent states that a native employed at the Wharf at East London, was killed on May 13th by an electric shock. He left his work to get a drink of water at a tap, and shortly afterwards was found lying dead, apparently from electric shock. It is supposed that there was a leakage of current from a cable which conveys energy to the electric cranes.

Thomas M'Coll, employed as a lineman by the Lanarkshire Tramways Co., was on a tower wagon, when in pulling a wire it gave way and he overbalanced and fell to the ground, sustaining fatal injuries.

According to a Reuter dispatch from Charleroi, three men were killed by electric shock while working an electric borer in a building yard at Dampremy on Tuesday.

The Electric Vehicle Committee.—At the last meeting of the Committee, held in Birmingham, sample charging plugs fitted with earth connection contacts were inspected, and a particular design was selected for standardisation; consideration was also given to the method of gripping the flexible cable to the plug and the connecting of the earth wire to the plug shell. It was decided to recommend that the plug receptacle on the vehicle should be fixed under the driver's seat, preferably with the plug pointing upwards so as to make it impossible for the driver to take his seat without noticing that the charging connection was attached to the vehicle. Cases were mentioned where serious damage had been caused by a driver starting his vehicle away without disconnecting the charging plug—the connection for the latter being placed at the rear or at the side of the vehicle. It was also decided to recommend that the fixed receptacle in the garage, for taking the charging connections, should be placed in an accessible position, preferably horizontal; and that the centre contact of the plug should always be the negative—the arrangement adopted by the Electric Vehicle Association, of America.

A communication was read from the Secretary of the B.E.A.M.A. stating that the Accumulator Manufacturers' Section of the Association had decided to recommend for standardisation a plate for electric vehicle batteries having dimensions of 8⅝ in. × 5¾ in., with lug centres 4¾ in; the accumulator manufacturers had under consideration standardisation in the sizes of the cells. Up to date 51 municipal electric supply undertakings and three company undertakings had agreed to a rate of 1d. per unit or less for "off peak" charging.

Further progress was made in the matter of arrangements for publicity and for garage and charging-station signs.

The Committee decided that the time had now arrived when it must be in possession of adequate funds. It was resolved that at least £200 should be obtained for carrying on the work up to the end of next December, any surplus available at that date to be carried over to the Committee's account in the next year or to the account of any other organisation which might be formed to take its place. Amounts totalling 35 guineas were promised at the meeting, and the secretary was instructed to approach the principal municipal-owned electricity supply undertakings and others with a view to obtaining contributions towards such a fund.

Five firms are arranging to send one or more vehicles each to the demonstration of electric vehicles at Birmingham in connection with the I.M.E.A. Convention.

Walking Races.—We are informed that the third annual London to Southend 41¾ miles walking race, promoted by the Hackney Walking Club, which took place on Whit-Monday, was a great success, splendid weather again favouring the event. Out of an entry of 10, eight started and six finished, C. H. Malivoire, of the Crypto Electrical Co., retiring at about 30 miles. The first three to finish were S. H. Smith (Hornsey), 7 hr. 24 min. 43 sec.; E. F. Newstead (Ilford), 7 hr. 27 min. 7 sec.; H. Gregory (Crypto Electrical Co.), 7 hr. 39 min. 58 sec. The times of the first three were considerably better than that of last year's winner, S. C. Haynes (Associated Fire Alarms, Ltd.), who took 7 hr. 54 min. 9 sec. for the journey.

Mine-Shaft Signalling.—An exhibition of shaft-signalling apparatus for mines, specially designed to meet the requirements of the new Mines Regulation Act, and brought together on the initiative of the Council of the South Wales Institute of Engineers, was held at Cardiff last week. The collection included types by the Adnil Electric Co., London; G. J. F. Black, Burton-on-Trent; John Davis & Son, Derby; Gent & Co., Leicester; Heyes & Co., Wigan; General Electric Co., London and Cardiff; Meehan & Sons, Glasgow; and Siemens Bros. & Co., Woolwich.

An Edinburgh Dispute.—The employés in the Edinburgh electrical contracting trade recently made application to the employers for a rise in wages of a penny per hour, and negotiations have taken place between representatives of the employers and representatives of the employés. Terms have now been arranged on the following basis: that an increase of ½d. per hour shall be given, to take effect on 15th inst., and that an additional ½d. per hour shall be given, to take effect on June 15th, 1915, provided that before that date there is no general fall in wages in the kindred trades, and it has further been agreed that these increases shall be binding on both sides for a period of one year.—*Edinburgh Evening News.*

Bradford Electrical Exhibition.—We are asked to state that on the recommendation of the B.E.A.M.A.—I.M.E.A. Exhibitions Joint Committee, the Council of the former Association has remitted its standing rule in respect of an electrical exhibition to be held under the auspices of the Bradford Corporation from October 6th to 24th, this year.

Chinese Minister visits Steel Works.—According to the *Times*, his Excellency Lew Yuk Lin, the Chinese Minister to England, paid a visit to the steel works of Messrs. Cammell, Laird and Co., and other Sheffield works, on May 26th.

Appointments Vacant.—A lecturer in physics (£250) and a lecturer in chemistry (£200) are wanted for the new Central School of Science and Technology. Technical assistant and testing engineer for Stoke-on-Trent Electrical Engineers' Department; jointer and fitter, for Bacup Corporation (45s.). Particulars are given in our advertisement pages.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—Bermondsey B.C. received 100 applications for the position of third engineer-in-charge at the electricity works. Of this number the Electricity Committee interviewed 12. The Council appointed MR. E. JACKSON, of Guildford.

The salary of MR. F. C. WHITEHEAD, charge engineer at the Accrington electricity works, is to be increased.

On leaving Nuneaton electricity works to take up the appointment of junior shift engineer at the Hinkley station of the Leicestershire and Warwickshire Electric Power Co., MR. G. ANDERSON was presented with a case of pipes and tobacco by the working staff.

On Wednesday evening last week, at the Tower Hotel, at a smoking concert arranged by the employés of the Urban Electric Supply Co., Hawick, Mr. H. C. Babb, chief assistant, who presided, presented MR. HENRY JOSEPH, the engineer and manager, with a wedding present from the staff. It took the form of an illuminated address, together with a travelling bag, a case of pipes and a pouch. Mr. Inglis (accountant) spoke of the excellent feeling that existed between the manager and the staff, and on behalf of the employés wished Mr. Joseph every happiness. Mr. Joseph feelingly replied, and the remainder of the evening was enjoyably spent in song and sentiment.

Tramway Officials.—MR. R. O. PICKMERE, for seven years chief engineering assistant to the West Ham tramways manager, has resigned his position, and has joined the firm of Messrs. Geo. W. Green & Co., of Feltham, Middlesex, makers of tramway overhead specialities.

General.—MAJOR HARLAND BOWDEN, the new Member of Parliament for North-East Derby, will be remembered by all of our readers as a former President of the Electrical Contractors' Association who, for two years, put such spirit into the propaganda work of that organisation at a time when it was necessary to build up the anti-municipal contracting fighting fund. Congratulations!

MR. ARTHUR VERNON HAYNE, of the Buenos Ayres staff of the Western Telegraph Cable Co., son of Mr. Arthur Hayne, of Southsea, a director of the company, who was married at Parkstone on Saturday, has been presented by his colleagues with a collection of plate.

MR. C. F. BUTLER, late of the County of London Electric Supply Co., Ltd., is leaving England to-day to take up a temporary position in India, and he expects to be away for about six months.

MR. ALBERT ISAAC BELISHA has been elected a director of the Metropolitan Railway Co.

It is announced in the Press that the Home Secretary has appointed MR. W. WALKER, H.M. Inspector of Mines in charge of the Scotland division, to the newly-created post of Deputy-Chief Inspector of Mines at the Home Office.

MR. F. G. MAXWELL WILLIAMS, B.Sc., manufacturers' agent, Montreal, Canada, is at present in this country on a business visit, and he will be glad to hear from firms engaged in the electrical industry who are desirous of opening or extending business connections with the Dominion. His address is Motley Bank, Camberley.

Obituary.—MR. A. BRUCE ANDERSON.—For the second time in a space of little more than two years, the world has been shocked by a terrible calamity at sea involving a colossal death roll. The British race, true to its great traditions, thinks lightly of the sea, and never travelled more than now. Every year many thousands journey westwards from these islands in pursuit of business or fortune in the great territories of Canada. In recent years few British electrical men had paid more frequent visits thereto than Mr. A. Bruce Anderson, who had devoted such close attention to the developments of the Ferranti business there. On May 2nd he left England to attend to various matters on that side; unfortunately, he began his homeward journey on the ill-fated *Empress of Ireland*, and unhappily is not among the survivors of the catastrophe which occurred on May 29th before the vessel was out of the St. Lawrence. We are quite sure that the whole industry, in the ranks of which Mr. Anderson was so widely known, will desire to offer its deep sympathy to the widow and three children who are left to mourn his loss. Mr. A. Bruce Anderson joined Mr. S. Z. de Ferranti in Charterhouse Square, London, E.C., about 1892 as an accountant. With the transference of the works to Lancashire, he moved to Hollinwood about the year 1897, and gradually rose in position until he became general manager; subsequently, in 1908, he was appointed managing director. We understand that he was held in the highest esteem by every employé of the company, and particularly by the staff, in every one of whom he took a personal interest. Mr. Anderson was also a director of Messrs. Bruce Peebles & Co., Ltd., chairman of the British Electrical and Allied Manufacturers' Association, and an ordinary member of the Council of the Institution of Electrical Engineers. He was recently appointed to the Council of the London Chamber of Commerce. He was also the president of the Failsworth and District Branch of the Tariff Reform League

Elliott & Fry] [*London.*

THE LATE MR. A. B. ANDERSON.

in which he took a great interest. His election to the chairmanship of the B.E.A.M.A. for the third year in succession was evidence of its members' appreciation of his powers in leadership, and of his organising abilities. A frequent text for his speeches was the necessity of subordinating individual or sectional interests to those of the whole body. Mr. Anderson was a young man—only 44 years of age—and his friends looked forward to many years of practical achievement at his hands. From the above it will be observed that it was just 22 years ago, when 22 years of age, that he first came into touch with Mr. Ferranti, to whom, as well as to the firm of Ferranti, Ltd, his loss comes as a personal one.

SIR JOSEPH WILSON SWAN.—The funeral of Sir Joseph Swan took place on Saturday last, May 30th, in the beautiful churchyard of All Saints, Warlingham, Surrey. Among those present were the following members of the family:—Lady Swan (widow); Mr. Donald Cameron-Swan, F.R.P.S., F.S.A.Scot. (eldest son) and Mrs. Cameron-Swan, also their sons, Ewen and Duncan; Miss Swan (eldest daughter); Mrs. Sharpe (daughter) and her daughter Viola; Mrs. Reginald Morcom (daughter) and Mr. Reginald Morcom; Mr. Kenneth R. Swan (son); Mr. Percival Swan, M.Inst.M.E. (son); Mr. John Cameron Swan, J.P. (brother); Miss White (sister-in-law); Miss Louisa White (sister-in-law); Mr. J. Arnold White (cousin of Lady Swan); Mr. George Swan (nephew) and wife; Mr. John W. Harvie (nephew); Mr. Carl Leyel (nephew); Mrs. Aneurin Williams (niece) and Mr. Aneurin Williams, M.P.; Mrs. Valpy (niece); Miss Atkinson (niece); Mrs. John Lion (niece); the Misses Mary and Emily Swan (nieces); Lt.-Col. Sir Charles Bedford, D.Sc., M.D. (nephew of Mr. J. Cameron Swan).

The following were among the friends present:—Sir Thomas Barclay; Prof. Carey Foster, F.R.S. (representing the Royal Society and University College, London, and the Institution of Electrical Engineers); Mr. Louis Brennan, C.B.; Mr. Payne, F.I.C. (of Mawson & Swan, Ltd., Newcastle); Mr. Robert Mond (Royal Institution); Mr. A. A. Campbell Swinton, M.I.E.E. (representing Institution of Electrical Engineers); Mr. John Spiller, F.I.C., F.C.S., F.R.P.S. (representing Royal Photographic Society); Prof. Harker, D.Sc., F.R.S. (representing National Physical Laboratory); Mr. Stuart Reid, D.C.L. (representing University of Durham); Mr. Morse; Mr. W. H. Patchell and Mr. Cyril Hitchcock (Institution of Mechanical Engineers); Mr. Walter Hibbert, F.C.S.; Mr. Hyde (former laboratory assistant); Mr. Greig (laboratory assistant); Prof. John Perry; Mr. H. C. Gover (formerly secretary of the Edison & Swan United Electric Light Co., Ltd.); Mr. F. W.

Reynolds (City of London Electric Lighting Co.); Dr. M. Perkin (British Science Guild). The Institution of Electrical Engineers was also represented by Col. R. E. Crompton, C.B., and Mr. James Swinburne, F.R.S., past-presidents; Mr. J. E. Kingsbury, member of Council, and Mr. P. F. Rowell, secretary. Over 70 wreaths and floral tributes were sent. The President of the Royal Society and the Lord Mayor of Newcastle were unable to carry out their intention of being present.

MR. N. L. WATT.—A Scottish correspondent writes:—"Mr. Norman Leslie Watt resident engineer at Brakpan for the Victoria Falls and Transvaal Power Co., whose death as the result of an accident is announced, was well known in Glasgow and the West of Scotland. Deceased was only 35. After serving his apprenticeship with Messrs. Grant and Ritchie, Kilmarnock, he studied electricity in Glasgow. Later he held an important post in one of the large London electricity works, and was selected from a long list of candidates for the Transvaal post. Mr. Watt, who was married about three years ago, leaves a widow and daughter."

MR. FREDERICK THOMAS, senior partner in the firm of Frelk. Thomas & Co., makers of electric light fittings, Drummond Street, Hampstead Road, N.W., who has been connected with the electrical industry for the past 25 years, passed away peacefully on Saturday last, after an illness lasting some months.

We regret to learn of the death of MR. S. L BENTLEY, partner in the firm of H. W. Butler & Co., Kingsway, W.C., which occurred somewhat suddenly from diabetes, on Saturday last, after an illness of only eight days. Mr. Bentley studied in the Polytechnics of Buda-Pest and Zurich, and in the Polytechnic School in Paris. He was a member of the Société Internationale des Electriciens. He joined the Electrical Power Storage Co., Ltd., in 1900, acting as their representative at the Paris Exhibition of that year, and at the Glasgow International Exhibition of the following year. He was for several years stationed in Glasgow as the E.P.S. representative for Scotland, subsequently adding to this the North of England. He left the company in 1912, joining Mr. Butler as partner. Mr. Bentley was at his office on May 20th, and up to the 27th ult. was expecting to be back at his post within a few days. Arrangements are being made for the business of H. W. Butler & Co. to be continued as heretofore.

Wills.—According to the *Financial Times* MR. JOHN GOTT, of Hove, chief engineer to the Commercial Cable Co., left £23,439 gross, and £22,268 net.

SIR RICHARD MOTTRAM, J.P., a director of Galloways, Ltd., left £9,320 gross, and £8,762 net personalty.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Magneta Time Co., Ltd.—A memorandum of satisfaction in full on April 30th, 1914, of debentures dated October 6th, 1911, May 24th, 1912, and February 3rd and December 10th, 1913, securing £2,240, has been filed.

Debenture dated April 30th, 1914, to secure £4,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Colonial Bank of Australia, Ltd., 33, Bishopsgate, E.C.

Edmundsons' Electricity Corporation, Ltd.—A memorandum of satisfaction in full on July 12th, 1912, of trust deed dated August 14th, 1908, securing £100,000 prior lien stock, has been filed (notified May 5th, 1914).

Edmundson's Electricity Corporation, Ltd. — Mortgage dated May 6th, 1914, to secure £18,000, charged on the undertaking authorised by a provisional order granted to the Urban District Council of Cromer, and land and buildings in Central Road, Cromer, &c. Holders: Commercial Union Assurance Co., Ltd., 24, 25 and 26, Cornhill, E.C.

Marbro, Ltd.—Particulars of £1,150 debs., created April 16th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Naylorgraph, Ltd.—Deb. dated April 29th, 1914, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital, subject to prior debs. for £3,000. Holder: J. M. Hunt, Fairlawn, Park Road, Southborough, Kent.

Wellingborough Electric Supply Co., Ltd. — Issue on May 5th, 1914, to secure £500 debentures, part of a series of which particulars have already been filed.

Pernambuco Tramways and Power Co., Ltd.—Issue on May 5th, 1914, of £100,000 debentures, part of a series of which particulars have already been filed.

Simplex Conduits, Ltd.—Capital, £100,000, in 10,000 preference shares of £5 each and 50,000 ordinary shares of £1 each. Return dated March 17th, 1914, 10,000 preference and 40,000 ordinary shares taken up, £50,000 paid on the preference, £40,000 considered as paid on the ordinary. Mortgages and charges: Nil.

James Keith & Blackman Co., Ltd.—Issue on May 15th, 1914, of £200 debentures, part of a series of which particulars have already been filed. A memorandum of satisfaction in full (*a*) on April 14th, of second deb. dated February 9th, securing £100, and (*b*) on May 15th, 1914, of debs. dated May 15th, 1906, and May 15th, 1911, securing £1,100, also notified.

Lord Howe Electrical Engineering Co., Ltd.—Particulars of £500 debentures, created May 11th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Godfrey Manufacturing Co. Ltd.—Mortgage on stores, offices, machine shop, dynamo house and land, &c., dated April 23rd, 1914, to secure all moneys due or to become due from the company to London City and Midland Bank, Ltd., 5, Threadneedle Street, E.C.

Para Electric Railways and Lighting Co., Ltd. (85,368).—Capital, £780,000 in £5 shares (78,000 pref. and 78,000 ord.) Return dated March 13th 1914. 64,000 pref. and 78,000 ord. shares taken up. £5 per share called up on 5,000 pref. and 8 ord. £25,040 paid. £634,960 considered as paid on 59,000 pref. and 77,992 ord. Mortgages and charges: £673,799 5 per cent. first deb. stock.

County of Durham Electrical Power Distribution Co., Ltd. (61,591).—Capital, £500,000 in 50,000 ord. and 50,000 pref. shares of £5 each; return dated March 20th, 1914; all shares taken up; £250,000 paid. Mortgages and charges: £250,000.

Crossley Brothers, Ltd (51,970).—Capital, £973,700 in 40,339 pref. and 57,031 ord. shares of £10 each; return dated March 10th, 1914; all shares taken up; £478,200 paid on 27,820 ord.; £695,500 considered as paid on 12,519 pref. and 57,031 ord. Mortgages and charges: Nil.

Rugby Lamp Co., Ltd.—Issue on May 13th, 1914, of £1,000 debentures, part of a series of which particulars have already been filed.

Eckstein, Heap & Co., Ltd. (126,262)—Capital, £50,000 in £1 shares. Return dated April 13th, 1914; 30,000 shares taken up; £7,500 paid; £22,500 considered as paid. Mortgages and charges: Nil.

CITY NOTES.

New General Traction Co., Ltd.

THE directors' report for the year ended March 31st, 1914, states that the revenue received and accrued amounted to £21,753 The general expenses, including directors' fees and legal charges, amounted to £2,038, and the debenture interest, less income-tax, to £7,231. The accounts show a profit of £12,484 plus £4,498 brought forward, making a total of £16,982 available for distribution. The directors recommend that £10,480 be devoted to the payment of a 4 per cent. dividend, less income-tax, and £6,502 carried forward. The accounts of the Norwich Electric Tramways Co. show that there was an increase in the traffic receipts for the year, and also an increase in the expenses. A dividend of 3 per cent. was received from that company for the year ended June 30th, 1913. The dividend received from the Coventry Electric Tramways Co. for the year ended December 31st, 1913, was 1s. 1d. per share. The Douglas Southern Electric Tramways, Ltd., paid 7 per cent. on its preference shares and 3½ per cent. on the ordinary shares, in respect of the year ended October 31st, 1913. The income received from the Philadelphia undertaking for the 12 months ended December 31st, 1913, amounted to £13,922. The directors' reports and accounts of the Coventry Electric Tramways Co., the Norwich Electric Tramways Co., and the Douglas Southern Tramways, Ltd., respectively, are circulated with the report of this company.

Merthyr Electric Lighting and Traction Co., Ltd.

MR. C. G. SOMERVILLE presided at the meeting held on May 27th at Electrical Federation Building. He moved the adoption of the report, which showed that the revenue during the year had been £24,167, an increase of £2 962. The directors recommended that £1,000 be put to reserve account, £1,500 was required for dividends on preference shares and at the rate of 7 per cent. per annum on the ordinary shares, carrying forward £606. On the electricity supply there had been an increase due to the extension of the main down the valley, and the units sold showed an increase of 18 per cent. This did not include the supply to the light railway, on which the increased receipts amounted to £12,600. The passengers carried were 2,174,102, an increase of 233,000, the largest number of passengers they had carried in any one year. Since the close of the year business had been progressive. The extensions at Cefn Coed were now being carried through.

MR. C. S. TEGETMEIER seconded, and the report was adopted.

At an extraordinary meeting a resolution was passed authorising the issue of the remaining 5,000 cumulative preference shares as ordinary shares. The CHAIRMAN said this was to facilitate obtaining new capital.

Nairobi Electric Power and Lighting Co., Ltd.

THE directors report that the progress of the company's working during the year 1913 is as under:—

	1912.	1913.	Increase.
Units generated	604,394	723,852	19·76 %
Customers connected at December ..	558	610	9·31 %
Motors connected B.H.P. at December ..	248	373	50·40 %
Private lights connected, 8-C.P. equiv. ..	10,658	13,745	28·96 %
Street lighting, 8-C.P. equiv.	2,000	2,000	—
Net profit	£2,642	£4,983	88·60 %

Negotiations with the Government have been satisfactorily concluded for the extension of the company's concession from 25 years to 50 years, and the grant of important falls on the Thika River for the generation of electricity, and arrangements are being made for the prompt extension of the company's plant for the production of electric current, which is urgently called for by the increased demand at Nairobi. In order to provide the necessary capital for the new installations of machinery and plant now required, the remainder of the ordinary shares of the company and of the authorised debentures will be issued.

Yorkshire (West Riding) Electric Tramways Co., Ltd.

—An interim dividend of 3 per cent. on the 6 per cent. cumulative preference shares is announced.

Hongkong Tramway Co., Ltd.

The annual meeting was held on May 27th at the offices, 19, St. Swithin's Lane, E.C., Mr. E. C. Morgan presiding.

In proposing the adoption of the report (see Elec. Rev., p. 921), the Chairman said that the boycott to which he referred at length last year had ceased and the traffic receipts for many months past had been very satisfactory. They would note that the Government had made a further payment of $15,248 towards the loss incurred by the company during the boycott, making, with the amount previously contributed, a total of $45,248. The currency question was as yet unsolved, and it would be seen from the profit and loss account that the loss on subsidiary coinage showed no abatement. They hoped, however, that the Government Ordinance which came into force on March 1st last might produce an improvement in the stability of the British subsidiary coin. They, however, did not look for any rapid change by reason of the fact that the British subsidiary coin was still in such excessive supply. A comparison of the various averages given at the end of the report showed a decided increase in the number of passengers carried and some increase in the mileage run. The earnings and the expenses were naturally higher in consequence, but they would see that the average fare per passenger had been well maintained, which indicated that the popularity of the tramways had not been prejudiced by the long period through which the boycott was in operation. A small increase had been made in the carrying capacity of the lines during the year. Representations had been made by certain of the shareholders and by the Stockbrokers' Association of Hongkong requesting the directors to take steps to establish a Colonial register to facilitate the transfer of shares in the colony, and arrangements were being made accordingly. Having regard to the difficulties they had had to contend with, he thought it was a very good report, and the figures of the traffics since the commencement of the present year would appear to indicate that it was reasonable to expect further improvement in their net receipts as soon as they were able to see more clearly the effect of the legislation upon the coinage question. They might have seen reports in the newspapers during the last few days regarding the increase of plague cases in Hongkong. Plague was always present there in some degree, but as it appeared to be somewhat more serious than usual, and might result in driving away some of the Chinese from the colony and thus adversely affecting their traffic receipts, they thought it desirable to cable to the manager for news. He had replied that in his opinion the worst was over, and he (the Chairman) hoped, therefore, they need not fear any serious consequences.

Mr. Robert Miller seconded the motion and the report was adopted.

West India and Panama Telegraph Co., Ltd.

The directors' report for the six months ended 31st December, 1913, states that the amount to credit of revenue is £38,699 against £38,505 for the corresponding half-year of 1912, and the expenses have been £25,630 against £24,428. The result is, therefore, a balance of £13,069 plus £1,837 interest on investments, and £3,185 brought forward, making an available total of £18,091. This amount is to be dealt with as follows:—First preference shares, dividend, six months to 31st December, 6s. per share, £10,369; second preference shares, dividend, six months to 31st December, 6s. per share, £1,401; ordinary shares, 1s. per share (free of income tax), £4,416; balance to current half-year's account, £1,905. The traffic receipts for the six months show an increase of £201 as compared with those for the corresponding period. In the directors' report for 31st December, 1911, it was stated that the exclusive rights, granted by Spain to the company for landing cables in Porto Rico, expired on 15th February, 1912, and that the United States Government had not acceded to the company's application for an extension of those rights. The Government subsequently granted permission to the Compagnie Française des Cables Télégraphiques to land their cable in Porto Rico; and since December last that company has been competing for Porto Rico traffic.

The annual meeting was held on May 28th at Winchester House, E.C.

Mr. G. von Chauvin (the Chairman) said that he was occupying the chair because Mr. Kingsford, the Chairman of the Company, was in the West Indies. He had visited almost the whole of their stations. During his stay he had looked into the business of the company and taken particular pains to see how the organisation was working, and he had put himself into communication with the Governors of the various colonies. Mr. Kingsford had also got into personal contact with the staff and settled a number of matters which it was difficult to handle by correspondence. He (the speaker) thought it would be found that the visit of their Chairman had distinctly benefited the company. Proceeding to propose the adoption of the report, the Chairman said that the total receipts for the half-year had amounted to £38,699, which was about £200 more than those for the corresponding half-year, which amounted to £38,505. The expenditure in the half-year was £25,629 against £24,427, an increase of £1,203. It was very striking to note how very near the expenses and the receipts had kept for the two half-years. As he had pointed out, as far as the income was concerned the difference was only £200, and while the expenditure was £1,203 more, that excess arose from the fact not that the ordinary expenditure had materially differed but that in the corresponding half-year the company received an amount derived from the use of their repairing ship by a neighbouring company which could be set off against the expenditure. The very closeness of the figures pointed to the fact that the management was carefully looking after all the details and that the usage which had been established by long time of the company's lines was a regular and steady one. The evenness of the expenditure was also very largely due to the excellent management of the repairing work. They had on board their ship a staff which was extremely valuable, and they had continually to congratulate themselves on the certainty with which they localised interruptions and faults and the rapidity with which those faults were taken out and repaired. With a large experience of cable companies, he was in a position to say that their staff was an exceedingly good one and the work done by it was exceedingly efficient. At the last meeting Mr. Kingsford referred to negotiations which were pending between the British Government and the company in which the Canadian Government and the Governments of the Colonies in the West Indies were concerned. Certain arrangements were then foreshadowed and he was sure the shareholders would be pleased to know that the Canadian Government had put that portion of the subsidy which was to be given to the company on to its Parliamentary estimates, and the British Colonies in the West Indies had all voted the continuation of those subsidies for ten years. They did not raise the subsidies which had been given up to the present, but they had given them for a fixed period of ten years. The consideration which the company had to give for the subsidies was a considerable, and in some cases a very drastic, reduction in the rates. They trusted that in course of time through the operation of the lowering of the rates traffics would be considerably increased, and that the payment which the company would have to make for the subsidies would be to a considerable extent set off by increased earnings. With regard to the competition which they had in Porto Rico, they had felt the effect of that competition on their receipts to a considerable extent. He had to say that there had been a considerable decrease in the traffics since the close of the financial year equal to very nearly 9½ per cent. of the total traffic. That was accounted for by the competition in Porto Rico and by the interruption of the Colon cable so that no traffic was at the present time coming to them from that part of the system.

Mr. W. H. Birks seconded the motion and the report was adopted.

Calcutta Electric Supply Corporation, Ltd.

The annual meeting was held, on May 28th, at Salisbury House, E.C., Mr. Paget V. Luke, C.I.E., presiding.

In proposing the adoption of the report (see Elec. Rev. p. 879), the Chairman said that considering the period had been a critical one in the history of the company, involving the closing down of all their old generating stations and the concentration of the whole supply at a new source, the record for last year would, he thought, be considered satisfactory. With an increased output and an increased revenue there was a reduction in working costs, and the accounts showed an increased net profit of nearly £17,000 as compared with 1912. The capital account had been increased by £67,959, due to the completion of their high-tension scheme, and to general expansion. When they remembered the size of the area, and the district covered by the company's licences, it was evident that a very large amount of work had to be done in order to cope with the constantly increasing demand for current, a demand which it would be unwise not to be prepared to meet. There must necessarily, therefore, be a constant extension of mains and additions to plant. That involved additional capital, and the directors, wishing to be in a position to raise whatever capital might be required, recommend that they be empowered to increase the capital by £500,000. The board had no intention of thowing that additional capital at once on the market, but proposed as money was required, that a portion of the issue be offered, on such terms as they might consider suitable, taking into account the state of the money market at the time of the issue, with the understanding that any new shares would be first offered to the existing shareholders. Turning to the revenue account, on the debit side there was a large saving in coal and wages at the generating stations, which was owing to the more economical plant and to the closing down of four generating stations and concentrating work at Cossipore. Against the saving thus effected, however, must be set the increased cost of wages, under distribution, owing to the number of men employed in the different sub-stations required under the new conditions. The sum of £7,564, under special charges, was an abnormal one, and represented work done for the new scheme and paid for out of revenue. While 1912 saw the opening of the high-tension generating station at Cossipore, 1913 had been occupied with its consolidation, the final closing down of the old generating stations, the opening of new sub-stations, and the disposal, so far as it had been possible, of the superseded plant. It must be understood that, in dis-

posing of this plant, it was probable some loss, even on its depreciated value, would be sustained, and provision was made for this prospective loss by additional transfers to the depreciation and renewals fund. In addition to work on the new scheme there had been extensions of mains which were constantly becoming necessary, and further additions to plant. One of the objects for which the directors sanctioned the large capital outlay necessary to reform the whole system of supply had been satisfactorily attained, and although the new plant was not fully at work until August last considerable economy in generating costs had already resulted. At the same time the company had been placed in a position to offer current to the manufacturing industries in Calcutta at a very low price. This was bringing a large number of consumers on to the mains which would materially add to the revenue. On the credit side there had been a gratifying increase in the receipts from sale of current, the net revenue having nearly doubled in the last five years. Applications for current for fans and lights showed no signs of falling off, and the demand for supply, from both small and large consumers, continued very encouraging. The street lighting contract for Howrah, which was mentioned last year, had been successfully started, and a number of thoroughfares were now lit by electricity. The result was very effective and would probably mean further extensions, not only in this district, for it had also led to enquiries from other districts of Calcutta. Owing to the satisfactory results of last year's working the directors felt justified in recommending an increase of the dividend for the year 1913, from 8½ per cent., at which it stood in 1912, to 9 per cent. While they were able to recommend an increased division of profits among the shareholders the board was of opinion that it was only fair that their customers should participate in the prosperity of the company. They were therefore considering the best means of making a reduction in the price for current for lighting purposes. They hoped to arrive at a decision very shortly and to make an announcement which they trusted would be satisfactory to the public in Calcutta. The directors, however, in considering this concession, had to remember that, while electric supply companies appeared to be only just recovering from the reduced demand due to the larger use of metal filament lamps, which consumed less current than the old carbon lamps, there was a possibility of the early introduction of a half-watt lamp which would again reduce the consumption of current for an equal amount of light. So far this half-watt lamp, which had been talked about for some time, had not yet been placed on the market in small sizes, but there was no saying how long it would be before the small size lamp was evolved. The preliminary report on the Calcutta improvement scheme, referred to last year, had now been published, and involved the widening of many roads and the pulling down of a large number of old houses. When those new roads were laid out, and the new buildings erected, the company might expect increased demands for electrical energy for lighting and fans. They had lately signed a contract for a supply of alternating current, on a large scale, to a jute mill, the supply to commence before the end of the current year. Other important contracts were under negotiation, and there seemed every reason to anticipate a period of increasing prosperity. Their agent and chief engineer reported that he had been loyally supported by the staff in Calcutta during the year, and the new bonus scheme, which was outlined when he (the chairman) last addressed them, had come into operation for the first time for the year 1913. Under its provisions a bonus of one per cent. on the net profits would be divided among the staff in India, in proportion to their salaries. This year the sum to be divided amounted to £1,271, which should prove to the staff the company's desire to associate them with its prosperity, and should act as an incentive for their loyal co-operation in keeping down expenses. The provident fund, to which the whole of the staff as well as the company, contributed, now exceeded £12,000, and was much appreciated by the employees. As stated in the report, in consequence of the increase of work in Calcutta, it had been found necessary to remove to new and larger offices. The company had been able to secure excellent premises, with plenty of room for the staff, without incurring much additional expense. For the same reason it had been decided to remove the office in London. New premises had accordingly been taken at No. 1, Broad Street Place, to which the work would be transferred early next month. That change would necessitate the retirement of Mr. Reeves, their secretary, but he was glad to say that that gentleman had consented to still serve the company in an advisory capacity.

SIR GUILFORD MOLESWORTH seconded the motion.

Replying to questions the CHAIRMAN said the board recognised that the services of Mr. Reeves to the company were very great, but it was impossible to add that gentleman to the board because the number of directors was limited to five by the articles. As he had said, they were retaining his services in an advisory capacity.

The report was adopted.

Subsequently a resolution was passed increasing the capital of the company from £1,000,000 to £1,500,000 by the issue of 100,000 new shares of £5 each.

The CHAIRMAN, in reply to questions, said it was impossible to say when they would be issuing any of the new shares, but he thought it would be necessary to raise some portion of the additional capital before the close of the year.

Madras Electric Supply Corporation, Ltd.

THE directors' report for the year ending 31st December, 1913, states that the number of units sold was 4,553,883 compared with 3,579,131 units in 1912, an increase of 974,752. 253 new consumers came on to the mains.

Year.	Consumers connected.	Total connections in KW.	Equivalent in 8-C.P. lamps.	Units sold.	Gross revenue.
1910	719	2,260	75,329	1,882,787	£17,454
1911	1,038	3,172	105,737	2,583,326	£25,898
1912	1,335	4,226	140,872	3,579,131	£33,890
1913	1,571	4,941	164,707	4,553,883	£41,175

The result of last year's working shows a loss, after meeting debenture and all other charges, of £10,526. The board forewarned the shareholders in their last report that the result for the year 1913 could not be otherwise than unsatisfactory, consequent upon their having to rely upon the old plant to meet the increasing demand. Unfortunately, the position was aggravated by the breaking down of the boiler plant in the early part of the year, necessitating the starting up by the Tramways Company of its own plant, which has since had to be kept running continuously in order to supplement the company's load; added to this, the coal situation showed no improvement, either as regards prices or deliveries. The new plant, the first portion of which it was anticipated would have been erected and in commercial operation before the end of last year, is not yet in commission, but from the latest reports from Madras, a start will take place about the end of June. On account of the condition of the old generating plant, no serious effort was made to procure new consumers, but the amount of energy sold during the year increased by over 27 per cent., and the directors are satisfied that there is plenty of scope for development. The scheme for the consolidation of the management of the company's and the tramways business referred to in the last report, was brought into operation on 1st December last, and the anticipated saving to both concerns has been fully realised. The result of the working of the tramways for the year 1913 showed, after providing for debenture interest, and transferring £7,000 to depreciation and renewal fund, an available balance, including the amount brought forward, of £12,553, compared with £10,523 for the previous year. A dividend of 5 per cent. was paid on the ordinary shares which are owned by this company, and £3,320 was carried forward. Mr. A. M. H. Walrond and Sir W. J. Cuningham, K.C.S.I., have resigned their seats on the board, and the directors desire to place on record their appreciation of the valuable services rendered by these gentlemen. Mr. James Gray (who has been a director of the Tramways Company since its incorporation) has been elected to fill one of the vacancies and has been appointed chairman. It is not proposed to fill the other vacancy at present.

Units generated	5,345,359
Units sold	4,553,883
Units used on works	181,832
Units lost and unaccounted for	609,644
Units sold—Street lighting	62,675
Lighting, fans, and small motors by meter	1,590,786
Power	2,900,422
Consumers connected	1,571
Maximum demand in KW.	1,648

Bachelet Levitated Railway.—It is reported in the daily Press that a prospectus of this company will shortly appear, offering 90,000 ordinary shares of £1 each. The directors, according to the *Times*, will include Major W. H. Houghton-Gastrell, M.P., Admiral Sir A. Paget, and Sir Harry Samuel, M.P. They propose to erect a full-sized track about a mile in length, on land placed at their disposal by the Great Central Railway. We have already made our position clear with regard to the prospects and possibilities of this system, and will only repeat that from an engineering point of view it is based on utterly fallacious ideas, the development of which can lead only to disaster. The cost of construction, working and maintenance will be so great as to render its operation on commercial lines impossible.

Since writing the above lines we have received a copy of the prospectus; the subscription list opened yesterday and closes to-morrow for town, and on Monday for the country. It is stated that no portion of the issue has been underwritten. The ordinary shares are entitled to one-third of the profits, the vendor shares to the remainder. Mr. Emile Bachelet is named as consulting engineer, and Mr. W. E. Lloyd as chief engineer. The company is to acquire the Bachelet patents in various countries. The exhibition and toy rights are not included in this sale. It is stated that the model track has been "examined" by many eminent engineers, scientists and experts. The present is a parent company, and its business will be confined to demonstrating the utility of the invention and to the promotion of companies in other countries; "from this source alone very large profits should accrue." The patentee will receive £20,000 in cash and £4,500 in vendor shares of 1s. each; the vendors to the company receive £35,000, namely £20,000 in cash, £10,000 in ordinary shares and £5,000 in vendor shares. The flotation is made on the strength of the impression made on the public mind by the toy track at Great Saffron Hill, and is supported only by a report signed by Mr. Bachelet, who, without a particle of experimental evidence, declares that on his system a speed of 300 miles an hour can be easily maintained throughout a journey of any length. He estimates the cost of a line for mail purposes at less than £5,000 per mile, and states that 1 KW. will carry a weight of 5 lb. At present only mail and express carriers are to be constructed. We earnestly advise our readers on no account to invest in this scheme.

Cubin Telephone Co.—The directors report that at March, 1914, there were 16,514 subscribers' stations connected to the system, a net gain for the year of 4,014, or a monthly gain of 334·5 telephones. That the gain was not larger was due to the impracticability of completing during the year the new automatic plants at Santiago and Sagua. According to the *Financier*, in the last annual report it was estimated that the gross annual earning capacity of the company would reach the million-dollar mark; not only has this been accomplished, but the figures for the closing months of the year indicate an advance at the rate of nearly $120,000 per annum beyond that point. It is believed that there will be an increase of 3,500 telephones in the present year, thus bringing the system to 20,000 subscribers one year hence. That this increase will produce a proportionate increase in earning capacity, and that the net earnings will be even greater in proportion are equally certain. This will be due to increased facilities for toll service and the increased number of subscribers, without a proportionate increase in operating and maintenance expenses.

Argentina.—The report of the Compania Telegrafico-Telefonica del Plata, for the year ended December 31st last, states that the revenue amounted to $292,814, as compared with $289 101 in 1912. There was, however, an increase in expenditure of $45,557. Due to the fact that the Compania Telegrafico-Telefonica Nacional did not earn sufficient to pay more than the guaranteed interest on the preferred shares, the company has not received anything, and for that reason the profit on the year's working only amounts to $2,931. The rebuilding of the lines has necessitated heavy expenditure, and the company has been compelled to borrow; on this account creditors figure in the balance-sheet for $425,739. —*Review of the River Plate.*

J. Stone & Co., Ltd.—The directors report an increase, both in volume of trade and in profit for 1913. It is proposed to pay a dividend on the ordinary shares at the rate of 10 per cent., together with a bonus of 3s. per share, adding to reserve £20,000, and carrying forward £125,162.

Birmingham District Power and Traction Co., Ltd.—The directors recommend a dividend of 3½ per cent. (7s. per share) on the preferred ordinary shares for the year to December 31st, £5 000 being placed to reserve and £11,457 carried forward. The annual meeting was held on Wednesday.

Consolidated Gas, Electric Light and Power of Baltimore, Co.—A dividend at the rate of 6 per cent. per annum on the common stock for the quarter ended June 30th is announced.

STOCKS AND SHARES.

Tuesday Evening.

It is not to be pretended that the Stock Exchange is in a particularly happy frame of mind. The principal bull point in the situation—and it would be an important one were there any confidence, any buying—is the ease of the money market. This shows signs, too, of becoming more pronounced, on the strength of which Consols started with a rise after the Whitsun holiday. The advance, however, was soon lost. Some of the financiers in Paris, with a ring of French speculators and another in St. Petersburg, seem to have as much as they can do at the present time to meet their obligations, and incessant sales from both centres have pressed harshly upon prices.

The news from Mexico read more hopefully at the end of last week, but the news that Carranza had taken active steps in the direction of Tampico, caused a lull in the rise of prices. On balance, however, they are decidedly better. In Brazilian issues, too, the tone is firmer, thanks to a substantial rise in the rate of exchange, this causing brisk demand for Brazilian Tractions and some of the other securities of Brazil that just lately have been most depreciated.

Home Railway stocks are in a state of suspended animation, in which whatever movement occurs is mostly towards lower levels. The Whitsun traffics failed to galvanise life or energy into the market, and most sections have suffered. Underground Electric Railways issues managed to shake themselves free from the prevailing dulness, and both classes of shares have improved—this in consequence of the proposed legal alteration in the form of the company, to which reference was made here last week. It is generally supposed that the resolutions will be adopted, and the £10 shares are ⅛ harder at 3¼, while the 1s. shares improved to 9s. 3d., the Income bonds rising a point to 89½. Districts, however, are a point down at 23, there being still some uneasiness as to what will be the upshot of the deliberations over the 'busmen's charter. Metropolitans contrived to gain ¼. British Electric Tractions show recovery from the disappointment felt with the dividend recently declared on the 7 per cent. Non-Cumulative Preferred stock, the price of this security rising 3 points to 58½, while the other stocks of the company are a firmer market. London and Suburban Preference improved to 12s. 6d., though the Debenture stock lost 2 points. Yorkshire (West Riding) Ordinary shares are ⅛ lower.

Electricity Supply issues are mostly firm, and there are rises of ⅛ in Charing Cross City Undertaking Preference and St. James' and Pall Mall Ordinary. County of London are steady at 12, which, by the way, seems to be a favourite figure at which both buyers and sellers fix limits for their orders, declining to give way ⅛ either side of this figure. The death of Sir Joseph Swan had no effect upon the price of the Edison & Swan descriptions. Electric Construction shares of both classes are *ex*-dividend.

Amongst other manufacturing concerns, British Westinghouse stands out as the most conspicuous from the Stock Exchange point of view. In the case of the company's Preference Shares, fresh buying occurred towards the end of last week, hoisting the price to 36s., the greater part of the rise being held. Glowing reports continue to reach the Stock Exchange of the Company's present prosperity, while the electrification of the North London Railway has, no doubt, much to do with the favour which the shares are enjoying just now. The rise, it may be pointed out, has been rapid, and, so far, little profit-taking has attended it. General Electric Preference moved up ⅛. Dick, Kerr Preference had a swift rise to 16s. 3d., and there are many inquiries for low-priced shares in this department which have not yet experienced improvement.

Latin-Canadians have experienced all-round recovery. Various bond issues of Mexican railroad companies are to have their current interest "satisfied" in scrip, but the prospect is regarded as being not all black, and (whatever shall happen next week) the rises in Mexican utility descriptions are quite respectable this time. Mexico Trams are 4 higher, Mexican Light and Power Common have gained 5½, while the various bonds are 1 to 3 points up. The market is better generally. Canadian Electrics exceptionally remain weak, but Montreal Light and Power rose 5 points to 227½. In the Brazilian group, Rio Tramway Firsts are once more within a point of par, and the Seconds at 89 are ½ better. Sao Paulo fives, *ex* dividend, look tempting at 97, considering the nature of their security. Para Electrics are unchanged. Brazil Traction spurted 3½, thus more than regaining their fall of the previous week. It should be emphasised, however, that the market in the various Latin-Canadians is still remarkably narrow, so that what in ordinary days would be considered mere normal buying or selling, has now an inordinate effect, either way, upon prices.

The dreadful disaster in the St. Lawrence River is a reminder, inevitable as melancholy, of the *Titanic* loss, with its amazing sequel, the Marconi boom. So rapidly have events—maritime, financial and political—marched since two years back, that the life-saving part again played by the Marconi apparatus in the latest disaster is scarcely mentioned even by the halfpenny papers. The market in Marconi shares continues dull, its usual Continental supporters allowing prices to sag quietly, though in official quotation the levels are maintained.

West India and Panama Ordinary shares are flat. There has been a little forced selling, and most of the Stock Exchange markets resent having shares, or stock, pressed upon them in dull days. Both Preference issues are lower, too. Western Telegraphs went back ⅛. The Eastern division keeps noticeably steady. Globe Preference, however, weakened slightly, and the Anglo-Americans are dull, Directs losing ⅛, Anglo-American Deferred following suit. Reuters at 8½ are *ex* dividend. Anglo-American Preferred stock and New York Telephone bonds remain in demand from investors. Callenders, *ex* dividend and bonus, are obtainable at 12, making the return 6½ per cent. on the money. India-Rubber shares fell 5s., and the Rubber market, with the price of the product about 2s. 4d. per lb. has relapsed into a state of semi-somnolence.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month.		No. of weeks.	Total to date.		Route miles open.	Inc.
		£	£		£	£		
Bath	May 23	4,039	+ 473	20	16,603	+ 1,329	..	..
Blackpool-Fleetw'd	,, 21	1,924	−1,792	20	8,529	— 1,976	8	..
Bristol	,, 22	34,915	+1,713	21	160,643	+13,454	30·5	..
Brit. Elec. Trac. Co.	,, 15	219,973	- 5,251			+12,177	429·8	..
Chatham and Dist.	,, 21	3,578	— 116	20	17,489	+ 275	14·98	..
Cork	,, 21	2,118	+ 133	20	9,544	+ 247	9·89	..
Dublin	,, 22	23,965	+ 54	21	111,574	— 2,643	54·25	..
Hastings	,, 20	3,691	— 377	20	..	— 173	19·3	..
Lancashire United	,, 20	6,711	+ 421	20	32,311	+ 3,819	42	·3
Llandudno-Col. Bay	,, 22	942	— 548	25	4,740	— 467	6·5	..
London United ..	,, 22	26,211	−1,559	21	120,784	+ 3,316	..	..
Tyneside	,, 20	2,117	+ 55	20	10,459	+ 627	11	..
Anglo-Argentine ..	,, 20	117,016	−2,322	20	1,126,715	+ 9,689	..	..
Auckland	,, 8	21,662	+ 6 6	44	235,592	+ 5 419	25·42	1·31
Calcutta	,, 23	17,3 3	+ 695	..	..	+ 4,330	..	..
Kalgoorlie, W.A. ..	April	2,820	..	17	9,805	..	20·5	..
Madras	May 15	4 33	+ 814	19	17,481	+ 1,353	15·25	..
Montevideo ..	April	29,615	— 442	26	200,176	+ 414	..	..
Cen. London Rly.	May 23	19,731	+ 314	21	105,915	— 3,771	6·78	·4
City & S. Lon. Rly.	,, 23	10,116	— 613	21	57,475	— 4,313	7·26	..
Dublin-Lucan Rly.	,, 22	592	+ 3	20	2,573	— 43	7	..
L'pool Overh'd Rly.	,, 24	7,245	+ 213	21	35,366	+ 1,265	6·6	..
London Elec. Ry. Co.	,, 23	54,720	— 120	21	301,205	+ 520	21·25	..
Mersey Railway ..	,, 23	880	— 98	21	47,352	+ 95	4·5	..
Metropolitan Rly.	,, 24	71,984	+4,605	21	376,036	+ 31,593	29·25	8·6
Met. District Rly.	,, 23	51,712	— 208	21	275,915	+ 800	25	..

SHARE LIST OF ELECTRICAL COMPANIES.

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations June 2nd.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref. Ord.	1	Nil	..	¾ — ⅞	..	Nil
Do. 5 % Pref.	1	5	5	⅞ — 1	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	70 — 75	..	6 0 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	14½ — 16½	..	..
Do. Do. Deferred	100	..	..	6¼ — 8¼	+1	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	89½ — 91½	..	6 11 2
Do. 7 % Non-Cum. Pr'f.	100	3	3½	57 — 60	+3	5 16 4
Do. 5 % Perp. Deb.	100	5	5	92½ — 94½	..	5 6 0
Do. 4½ % 2nd Deb.	100	4½	4½	77 — 80	..	5 12 9
Central London Railway, Ord.	100	8	8	57 — 62	..	4 16 9
Do. Gtd. Assented	100	..	4	82 — 84	..	4 15 3
Do. Pref.	100	4	4	68 — 73	..	5 9 7
Do. Gtd. Assented	100	..	4	84 — 86	..	4 13 0
Do. Def.	100	2	2	40 — 45	..	4 9 0
Do. Gtd. Assented	100	..	4	80 — 82	..	4 17 7
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	95 — 97	..	5 3 1
Do. Do. 1896	100	5	5	91 — 94	..	5 6 5
Do. Do. 1901	100	5	5	89 — 92	..	5 8 8
Do. Do. 1908	100	5	5	89 — 92	..	5 8 8
Do. 4 % Deb.	100	4	4	86 — 88	..	4 11 0
Hastings Trams, 6 % Pref.	1	6	6†	⅞ — ⅞	..	8 6 8
Do. 4½ % Deb.	100	4½	4½	65 — 70	..	6 8 7
Isle of Thanet Trams, 5 % Pref.	5	2½	2	2 — 2½	..	6 0 0
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	87 — 89	..	5 12 4
London and Suburban, Ord.	1	..	..	⅜ — ⅜	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	⅞ — 1	+⅛	7 5 8
Do. Do. 4½ % 1st Deb.	100	4½	4½	75 — 80	−2	5 12 5

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations June 2nd.	Rise + or Fall —	Present Yield p.c. £ s. d.
London Elec. Railways, 4 % Deb.	100	4	4	90 — 92	..	4 7 0
London United Trams, 4 % Deb.	100	4	4	56 — 60	..	6 13 4
Metropolitan Railway Consol.	100	13	13	89½ — 40	+ ½	4 1 3
Do. Surplus Lands	100	2½	2½	61 — 63	..	4 7 4
Do. 3½ % Deb.	100	3½	3½	87 — 89	..	3 18 7
Do. 3½ % Pref.	100	3½	3½	82 — 84	..	4 3 4
Do. 3½ % Con. Pref.	100	3½	3½	80 — 82	..	4 5 4
Metropolitan District Ord.	100	Nil	..	22¾ — 23¼	−1	Nil
Do. 6 % Deb.	100	6	6	138 —141	..	4 5 3
Do. 4 % Deb.	100	4	4	93 — 95	..	4 4 1
Do. 4 % Prior Lien	100	4	4	95 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	83 — 86	..	5 4 8
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
Do. 5 % Deb.	100	5	5	85¼ — 88¼	..	5 13 0
Potteries, Ord.	1	3½	3½	⅜ — ⅜ xd	..	8 12 10
Do. 5 % Pref.	1	5	5	⅝ — ¾	..	7 19 8
Do. 4½ % Deb.	100	4½	4½	81½ — 84½	..	5 6 2
South Metro. Trams, 4 % Deb.	100	4	4	66 — 70	..	5 14 4
Underground Elec. Railways	10	..	..	8⅛ — 8⅜	+ ⅛	Nil
Do. "A"	1/-	..	..	⅛ — ¼	+⅛	Nil
Do. 6 % First Cum. Inc. Deb.	100	6	6	115 —117	..	5 2 7
Do. 4½ % Bonds	100	4½	4½	99½—101½	..	4 8 6
Do. 6 % Income	100	6	6	89 — 90	+1	6 13 4
Yorkshire (West Riding), Ord.	5	Nil	Nil	⅛ — ⅜	−⅛	Nil
Do. 6 % Pref.	5	3	4	4⅛ — 4⅜	..	4 2 8
Do. 4½ % Deb.	100	4½	4½	84 — 87	..	5 3 6

ELECTRIC RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4¼ — 4⅜	..	5 11 4
Do. 2nd Pref.	5	5½	5½	4¼ — 4⅜	..	6 2 3
Do. 4 % Deb.	100	4	4	92½ — 94½	..	4 4 8
Do. 4½ % Deb.	100	4½	4½	98½—101½	..	4 8 6
Do. 5 % Deb.	100	5	5	94 — 96 xd	..	5 4 0
Auckland Trams, 5 % Deb.	100	5	5	103 —106	..	4 14 3
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11⅛	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	94½ — 96½	..	4 13 3
Do. 5 % 2nd Deb.	100	5	5	99 —101	..	4 19 0
Brazilian Traction, Light and Power	$100	6	6†	80½ — 82⅝	+3½	7 5 5
Brisbane Trams Invt., Ord.	5	8	8	6⅜ — 7⅛ xd	..	5 12 3
Do. 5 % Pref.	5	5	5	4⅜ — 5⅛ xd	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	98 —101	..	4 9 1
B. Columbia Elec. Rly., Def.	100	8	8†	110 —114	..	7 0 4
Do. Pref. Ord.	100	6	6	103 —107	..	5 12 1
Do. 5 % Pref.	100	5	5	103 —106	..	4 14 2
Do. 4½ % 1st Mort. Deb.	40	4½	4½	97 —100	..	4 10 0
Do. 4½ % Vancouver Deb.	100	4½	4½	94 — 98	..	4 12 0
Do. 4½ % Con. Deb.	100	4½	4½	93½ — 95½	..	4 9 1
Calcutta Trams, Ord.	5	7½	9†	6½ — 7	..	6 15 9
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	97 — 100	..	4 10 0
Cape Electric Trams	1	5	5	⅝ — ¾	..	6 13 4
City Buenos Aires Trams (1904)	5	5	5	5⅜ — 5⅞	..	4 11 11
Do. 4 % Deb.	100	4	4	93 — 97	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	90 — 94	+2	5 6 8
Havana Elec. Rly., 5 % Bonds	$1000	5	5	93½ — 97½	..	5 2 6
Kalgoorlie El. Trams 5 % A Deb.	100	5	5	84 — 89	..	5 12 4
Do. 6 % B Deb.	100	3	..	10 — 20	..	Nil

La Plata Elec. Trams, Ord.	1	..	..	⅛ — ⅜	..	..
Do. Pref.	1	4½d.	6	⅜ — ⅝	..	6 5 0
Lisbon Elec. Trams, Ord.	1	6	6	1⅜ — 1⅝	..	4 9 3
Do. 6 % Pref.	1	6	6	1⅜ — 1⅝	..	5 1 0
Do. 5 % Deb.	100	5	5	95 —100	..	5 0 0
Madras Elec. Tr., 6 % Cum. Pref.	5	6	6	4½ — 5½	..	5 14 3
" Elec. Tr. (1904), Deb.	100	5	5	101 —103	..	4 17
Manaos Trams & Lt., 1st Deb.	100	5	5	78 — 81	..	6 3 5
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98½—100½	..	4 19 6
Mexico Trams Com	$100	7	7	71 — 75	+4	..
Do. Gen. Con. 5 % Bonds	..	5	5	78 — 82	+1	6 2 0
Do. 6 % Bonds	100	6	6	75 — 80	..	7 10 0
Para Elec. Rlys. & Lt., Ord.	5	10	10	3½ — 4⅜	..	11 8 6
Do. 6 % Pref.	5	6	6	4 — 4½	..	6 13 4
Do. 5 % 1st Deb.	100	5	5	86½ — 89½	..	5 11 8
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	95 — 97	..	4 12 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	98 —100	+2	5 0 0
Do. 5 % Mort. Bonds	100	5	5	88 — 90	+ ½	5 11 1
Sao Paulo Tram., Lt. and P. 5 % 1st Deb.	$500	5	5	94 — 98 xd	..	5 2 0
Singapore Trams, 5 % Deb.	100	5	5	88 — 92	..	5 8 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95 — 97	..	5 3 0
Un. Elec. Trams Monte Video	5	7	7	4⅜ — 5⅛	..	6 16 7
Do. 6 % Pref.	5	6	6	4⅜ — 5⅛	..	5 14 3
Do. 5 % 1st Deb.	100	5	5	92½ — 95½	..	5 4 9
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	93½ — 95½	..	4 14 3

ELECTRICITY SUPPLY AND POWER COMPANIES.—HOME.

Bournemouth & Poole, Ord.	10	6	7	10 — 11	..	6 7 4
Do. 4½ % Pref.	10	4½	4½	9 — 10	..	4 10 0
Do. Second 6 % Pref.	10	6	6	10⅜ — 10⅞	..	5 10 4
Do. 4½ % Deb. Stock	Stock	4½	4½	95 — 98	..	4 11 9
Brompton & Kensington, Ord.	5	10	10	8⅜ — 9⅛	..	5 8 1
Do. 7 % Cum. Pref.	5	7	7	8¼ — 8⅝	..	4 0 0
Central Electric Supply, 4 % Guar. Deb.	100	4	4	89½ — 92½ xd	..	4 6 8
Charing Cross, West End & City	5	5	6	4⅞ — 5⅜	..	5 11 7
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 5	..	4 10 0
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	+ ⅛	4 14 9
Do. Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Chelsea, Ord.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % Deb.	Stock	4½	4½	97 — 100	..	4 10 0
City of London, Ord.	10	9	10	16 — 17	..	5 17 8
Do. 6 % Cum. Pref.	10	6	6	12½ — 13½	..	4 9
Do. 5 % Deb.	Stock	5	5	116 —120	..	4 7 4
Do. 4½ % Second Deb.	100	4½	4½	100 —103	..	4 8 1
County of London, Ord.	10	6	7	11⅜ — 12⅛	..	5 14 3
Do. 6 % Pref.	10	6	6	11⅞ — 12⅜	..	4 17 0
Do. 4½ % Deb.	Stock	4½	4½	103 —106	..	4 5 3
Do. 4½ % Second Deb.	Stock	4½	4½	98 —101	..	4 9 1
Edmundson's, Ord.	£3	..	..	⅝ — ¾	..	Nil
Do. 6 % Cum. Pref.	5	6	6	6¾ — 7	..	7 10 0
Do. 6 % Non-Cum. Pref.	5	..	..	1⅝ — 2	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	84 — 87	..	5 3 6
Folkestone	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % First Deb.	100	4½	4½	93 — 95	..	4 14 9

Hove	5	8	9	8¾ — 9	..	5 0 0
Kensington & Knightsbridge, Ord.	5	8	9	7¾ — 8	..	5 12
Do. 4 % Deb.	Stock	4	4	90 — 92	..	4 7
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	76 — 80	..	5 12 0
London Electric, Ord.	3	2½	3	1⅜ — 1⅝	..	5 2 7
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	..	5 14 8
Do. 4 % First Mort. Deb.	Stock	4	4	92½ — 95½	..	4 3 9
Metropolitan	5	4½	4½	8¾ — 9⅛	..	6 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4¾ — 5	..	4 10 0
Do. 4½ % First Mort. Deb.	Stock	4½	4½	97 —100	..	4 10 0
Do. 3½ % Mort. Deb.	Stock	3½	3½	83 — 86	..	4 1 4
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98 —101	..	4 19 1
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9⅞ — 10½	..	5 14 3
Oxford	5	7	7	5⅞ — 6⅛	..	5 11 0
St. James' and Pall Mall, Ord.	5	10	12	9¾ — 10	+ ⅛	6 0 0
Do. 7 % Pref.	5	7	7	6⅞ — 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	83 — 86	..	4 1 4
South London, Ord.	4	5⅜	5⅜	2⅞ — 3⅛	..	6 10 4
Do. 5 % First Mort. Deb.	100	5	5	99 —102	..	4 18 0
South Metropolitan, 7 % Pref.	1	7	7	1⅝ — 1⅞	..	5 6 8
Do. 4½ % First Deb. Stock	100	4½	4½	97 — 100	..	4 10 0
Urban, Ord.	£3	Nil	..	⅛ — ⅜	..	..
Do. 5 % Cum Pref.	5	3†	4	2¾ — 3	..	6 13 4
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	..	5 4 8
Westminster, Ord.	5	10	10	8½ — 8¾	..	5 14 3
Do. 4½ % Cum Pref.	5	4½	4½	4⅛ — 5⅛	..	4 6 9

* Unless otherwise stated, all shares are fully paid. † Interim Dividend. ‡ And Funded Certs.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—*(Continued.)*

ELECTRICITY SUPPLY AND POWER—COLONIAL AND FOREIGN.

NAME.	Stock or Share.	Dividends for		Closing Quotations June 2nd.	Rise + or Fall —	Present Yield p.c.
Adelaide, 6 % Pref.	£5	6	6	5¼ — 5⅜	..	£ s. d. 5 11 7
Calcutta, Ord.	£5	8½	9	7⅞ — 8	..	5 12 6
Do. 5 % Pref.	£5	5	5	5 1/16 — 5 5/16	..	4 14 1
Calgary Power, 1st Mort. Bds. ..	100	5	5	90½ — 92½	..	5 8 0
Canadian Gen. El. Com.	$100	7	8	103 —108	..	7 5 6
Do. 7 % Pref.	$100	7	7	117 —122	..	5 13 10
Cordoba Lt., Power and T., Ord.	£1	5	..	7/16 — 8/16	..	7 12 0
Do. 5 % Deb.	100	5	5	87 — 90	..	5 11 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	83 — 88	..	6 14 10
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	91 — 94	..	5 6 5
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	98½—95½	..	5 4 9
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	3/16 — 3/32	..	Nil
Do. 6 % Pref.	£1	6	4	1/4 — 3/8	..	8 0 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	108 —105	..	4 15 2
Madras, Ord.	£5	Nil	..	1½ — 1¾	..	..
Melbourne, 5 % 1st Mort. Deb. ..	100	5	5	105 —108	..	4 12 6
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	61 — 66	+3	7 11 6
Mexican Lt. & Power, Common	$100	4	4†	43 — 47	+5½	..
Do. 7 % Cum. Pref.	$100	7	7	71 — 75	+2½	9 6 8
Do. 5 % 1st Mort. Gold Bds.	..	5	5	73 — 78	+3	6 8 4
Do. 5 % 2nd Mort. Bonds ..	100	5	5	59 — 64 xd	+2½	7 13 3
Monterey Rly., Light & Power, 5 % 1st Mort. Deb.	* 100	1912. 5	1913. 5	51 — 55	+ 1	..
Montreal, Lt., H. and Power ..	$100	9	10†	225 —230	+ 5	4 7 0
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5a	5a	10 — 20	..	..
River Plate, Ord.	Stock	10	10	235 —245 xd	..	4 1 8
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	97 —103	..	5 16 6
Do. 5 % Deb. Stock	Do.	5	5	101 —103	..	4 17 0
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital ..	$100	5½	6	134 —138	..	4 7 0
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 7
Do. 4½ % Per. Deb.	Stock	4½	4½	99½ —101½	..	4 8 8
Toronto Power, 4½ % 1st Deb. ..	Do.	4½	4½	98 —100 xd	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	85 — 87	..	5 15 0
Victoria Falls Power, Pref. ..	1	6	6	33/32 — 35/32	..	7 13 4
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105	..	5 14 3

MANUFACTURING COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations June 2nd.	Rise + or Fall —	Present Yield p.c.
Aron, Ord.	£1	7	..	33/32 — 37/32	..	£ s. d. 8 5 0
Do. 6 % Pref.	£1	6	6	1/4 — 5/16	..	6 17 2
Babcock & Wilcox	£1	16	16	2½ — 3 1/16	..	5 4 7
Do. Pref.	£1	6	6	1¼ — 1⅜	..	4 7 6
British Aluminium, Ord.	£1	..	5	1 1/16 — 1 1/8	..	4 14 1
Do. 6 % Cum. Pref.	£1	6	6	7/8 — 15/16	..	6 8 0
Do. 5 % Prior Liens Debs. ..	100	5	5	97 —100	..	5 0 0
Do. Deb. Stk.	100	5	5	90 — 95	..	5 5 3
B.I. & Helsby Cables	£5	10	13	9½ — 9⅝	..	6 13 4
Do. Pref.	£5	6	6	5⅞ — 6⅛	..	4 14 1
Do. Deb.	100	4½	4½	101 —104	..	4 6 9
British Thomson-Houston, Deb.	100	4½	4½	92 — 94	..	4 15 9
British Westinghouse, Pref. ..	£2	Nil	5	1 31/32 — 1 33/32	+ 1/32	5 8 6
Do. Deb.	100	4	4	73 — 75	..	5 6 8
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	£1	..	..	2/- —3/-	..	Nil
Do. Pref.	£1	..	..	8/- —8/6	..	Nil
Brush, 7 % Pref.	£2	Nil	..	0 — 1/4	..	Nil
Do. 5 % Prior Lien Deb. ..	100	5	5	80 — 85	..	5 17 8
Lo 4½ % Deb.	100	4½	4½	50 — 55	..	8 3 8
Do. 4½ % Second Deb. ..	100	4½	4½	29 — 33	..	13 12 8
Callender's Cable	£5	15	15	11⅞ — 12½ xd	..	6 3 8
Do. Pref.	£5	5	5	5 — 5½	..	4 16 5
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Castner-Kellner	£1	20	22½	23 — 3/8	—1/8	8 11 5
Do. Deb.	100	4½	4½	104 —107	..	4 4 1
Crompton & Co., Deb.	100	5	5	83 — 85	..	5 17 8
Dick, Kerr	£1	Nil	..	3/8 — 5/8	..	..
Do. Pref.	£1	6	6	1/4 — 5/16	+ 1/32	6 17 2
Edison & Swan, A, £2 paid ..	£5	Nil	..	0 — 1/8	..	Nil
Do. fully paid	£5	Nil	..	1 — 1⅛	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	61 — 66	..	7 11 6
Electric Construction	£1	5	6	9/16 — 13/16 xd	..	8 14 6
Do. Pref.	£1	7	7	1 — 1⅛	..	6 4 5
Greenwood & Batley, Pref. ..	£10	7	7	6½ — 7½	..	9 13 2
Do. Deb.	100	5	5	92 — 94	..	5 6 5
General Electric, 6 % Pref. ..	£10	6	6	10 1/16 — 10 1/8	+ 1/16	5 18 9
Do. Deb.	100	4	4	87 — 91	..	4 8 0
Henley's, Ord.	£5	15	20	14½ — 15½	..	6 9 0
Do. Pref.	£5	4½	4½	4⅞ — 5⅛	..	4 7 10
Do. Deb.	100	4½	4½	99½ —107⅝ xd	..	4 8 8
India-Rubber, G. & T.	£10	7½	7½	9⅞ — 10 1/32	— 1/4	6 19 5
Do. Pref.	£10	5	5	8⅞ — 9⅛	..	5 5 3
Telegraph Construction	£12	20	20	36½ — 38½	..	6 4 7
Do. Deb.	100	4	4	98 —100	..	4 0 0
Willans & Robinson, 4 % 1st Mort. Deb.	100	4	..	63 — 67	— 1	5 19 8
Do. B 4 % Cum. Pref. ..	100	..	£4	40 — 44 xd	..	9 1 10

TELEGRAPH AND TELEPHONE COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations June 2nd.	Rise + or Fall —	Present Yield p.c.
Amazon Telegraph	£10	4½	4½	5⅞ — 6⅛	..	£ s. d. 7 4 0
Do. 5 % Deb. Red.	Stock	5	5	94 — 97	..	5 3 0
American Telep. & Teleg., Cap.	$100	8	8	123 —127	..	6 6 0
Do. Collat. Trust	$1000	4	4	91 — 94	..	4 5 0
Anglo-American Telegraph ..	Stock	3	3	64 — 67	..	4 9 7
Do. 6 % Pref.	Do.	6	6	108½—109½	+ 1/2	5 9 7
Do. Def.	Do.	30/-	30/-	23 — 25½	— 1/8	6 7 8
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	£5	8	6†	7⅛ — 7⅜	..	5 6 8
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	7 — 81	..	4 18 9
Cuba Telegraph	£10	6	6†	8⅜ — 9⅜	..	6 6 4
Do. 10 % Pref.	£10	10	10	16 — 17	..	5 17 8
Direct Spanish Telegraph, Ord.	£5	4	4	3¾ — 4	..	5 0 0
Do. 10 % Cum. Pref.	£5	10	10	7½ — 7⅝	..	6 9 0
Direct United States Cable ..	£10	4	4	6⅛ — 6⅝	— 1/8	5 16 4
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7	180 —183	..	5 5 3
Do. 8½ % Pref. Stock	Do.	8½	8½	77 — 79	..	4 8 9
Do. 4 % Mort. Deb.	Do.	4	4	9⅛ — 96	..	4 3 4
Eastern Extension	£10	7	7	12⅜ — 13	..	5 7 9
Do. 4 % Deb.	Stock	4	4	94⅜ — 96⅜	..	4 3 0
Globe Telegraph and Trust ..	£10	6	6†	10⅞ — 11⅜	..	5 5 4
Do. 6 % Pref.	£10	6	6	12⅜ — 12⅝	— 1/4	4 13 4
Great Northern Telegraph ..	£20	20	20	31 — 33	..	6 1 1
Indo-European Telegraph ..	£25	13	13	56½ — 58½	..	5 11 1
Mackay Companies Common ..	$100	5	5	81 — 84	..	5 19 1
Do. 4 % Cum. Pref.	$100	4	4	68 — 71	..	5 12 7
Marconi's Wireless Telegraph ..	£1	20	20	3 — 3⅛	..	6 7 10
Do. 7 % Cum. Partic. Pref. ..	£1	17	..	2⅜ — 2⅝	..	6 9 6
Monte Video Telephone, Ord. ..	£1	6	6	1 5/16 — 1 7/16	..	6 8 0
Do. 5 % Pref.	£1	5	5	1 5/16 — 1 7/16	..	5 18 6
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	99½ —100⅞	— 1/4	4 9 6
Oriental Telep. and Elec. ..	£1	10	10	2 1/16 — 2 1/8	..	4 6 7
Do. 6 % Cum. Pref.	£1	6	6	1 31/32 — 2 1/32	..	4 13 5
Do. 4 % Red. Deb.	Stock	4	4	87½ — 89½	..	4 9 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	..	4 0 0
Reuter's	£10	10	7	8 — 9 xd	..	7 15 7
Submarine Cables Trust	Cert.	6	6	126 —129	..	4 13 0
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	98 —100	..	4 10 0
United River Plate Telephone	£5	8	6†	6⅞ — 6⅞	..	5 18 5
Do. 5 % Cum. Pref.	£5	5	5	5⅛ — 5⅜	..	4 9 0
West Coast of America	2½	2½	N	3/8 — 1/2	..	Nil
Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4	4	96 — 99	— 3/8	4 0 10
West India and Panama Teleg.	10	1¼	1½	1¼ — 1⅜	..	7 2 10
Do. 6 % Cum. 1st Pref. ..	10	6	6	9¼ — 9⅝	— 3/8	6 3 1
Do. 6 % Cum. 2nd Pref ..	10	6	6	8⅜ — 9	— 1/8	6 13 4
Do. 5 % Debs.	100	5	5	97 — 99	..	5 1 0
Western Telegraph, Ltd. ..	£10	7	7	18⅛ — 18⅜	— 1/8	5 1 11
Do. 4 % Debs.	Stock	4	4	96⅛ — 97⅛	..	4 2 1
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	94 — 97	..	4 12 9

* Unless otherwise stated all shares are fully paid. † Interim dividend. a Paid in deferred interest warrants.

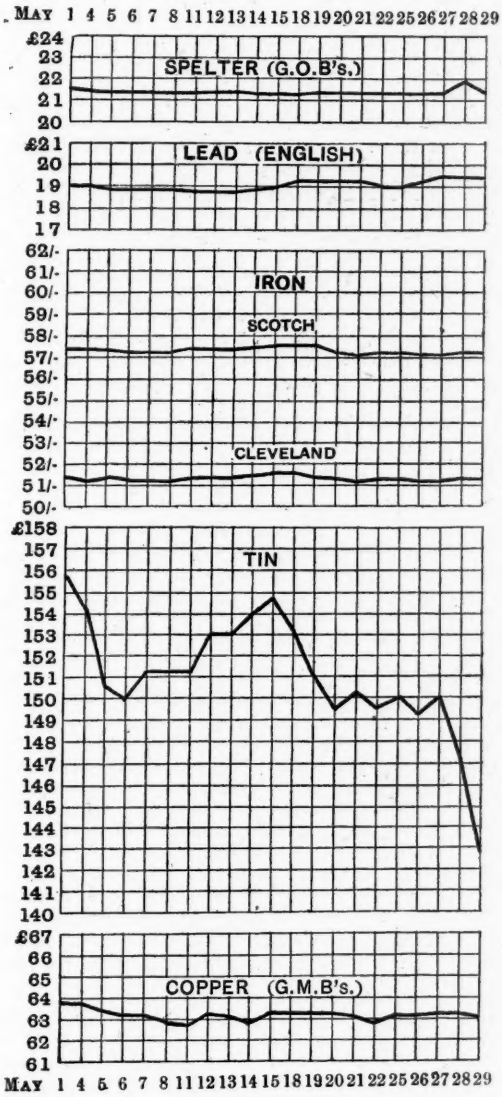
Bank rate of Discount 3 per cent., January 29th, 1914.

A Twenty-First Anniversary.—On May 23rd the staff of the Newcastle branch of MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., celebrated the 21st anniversary of the establishment of the branch by an enjoyable outing. On the invitation of the firm, they, together with their wives and friends, were conveyed by motor to Rothbury, where they were entertained at dinner. Mr. Campbell proposed the health of Messrs. Siemens, thanking them for their hospitality, and Mr. Ball responded on their behalf. Owing to the bad weather, the sports programme had to be somewhat curtailed and a whist drive was substituted. The evening, however, was fine, and the following events were carried out, concluding a most successful day:—Egg and spoon race for ladies; blindfold race; 100 yds. staff consolation handicap; and tug-of-war.

Electric Clocks.—We understand that when MESSRS. VICKERS, LTD., went three years ago into their new office buildings at Westminster, they decided to equip them with electric clocks, and invited three manufacturers to equip a couple of floors each on trial. We are informed that the period of test has now expired, and the firm's decision has been in favour of the Synchronome system with which their works at Sheffield, Barrow-in-Furness and Montreal are also equipped. At 10 days' notice the Synchronome Co., Ltd., were instructed to extend their system of 73 clocks by the addition of a further 52 of a special type suitable to the building. This extension was successfully carried out between the time of closing on Saturday and re-opening on Tuesday morning of the Whitsuntide week-end.

METAL MARKET.

Fluctuations in May.



Electricity Supply Rifle League.—The following matches have been decided during May :—Brimsdown (Mursell, 97), 541, Ilford (Tufnell, Brown, 97), 564 ; Brimsdown (Dartnall, 97), 552, Westminster (H. Pearman, 97), 558 ; Brompton (Austin, 98), 565, Ilford (Bailey, McKelvey, 96), 569 ; Brompton (Furneaux, 96), 561, Shoreditch (Harrison, Weekes, 99), 585 ; Central (Cope, 97), 561 ; City Co. (Harlow, 98), 554 ; Central (Robinson, 98), 567, Hackney (Hilling, Matthews, Self, 97), 570 ; Central (Robinson, 98), 573, Shoreditch (Ebner, 99), 578 ; City Co. (Harlow, 96), 549, Westminster (W. Pearman, 97), 557 ; City Co. (Harlow, 96), 557, Ilford (Tufnell, 95), 555 ; Hackney (Self, 97), 561, Poplar (Randall, Cruickshank, 95), 548 ; Hackney (Hilling, Matthews, 96), 562, Ilford (McKelvey, Bailey, Haeger, 98), 563 ; Poplar (Randall, 96), 545, Westminster (Horley, 95), 555 ; St. James's (Cockburn, 95), 555, Westminster (Winchcombe, 98), 569. The following are the positions to date :—

	Matches.				Scores.		Average
	Shot.	Won.	Lost.	Pnts.	For.	Agnst.	per match.
Shoreditch ...	6	5	0	12	3,456	3,316	576·0
Central ...	7	5	2	10	3,991	3 868	570·14
Westminster	7	5	2	10	3.898	3,898	556·85
Brompton ...	7	4	3	8	3,958	3,933	565·43
Ilford ...	8	4	4	8	4,673	4,422	559·12
Hackney ...	6	3	3	6	3,314	3,323	552·3
St. James's ...	5	2	3	4	2 783	2,805	556·6
City Co. ...	5	2	3	4	2,761	2,776	552 2
Brimsdown ...	5	0	5	0	2,726	2,801	545·2
Poplar ...	6	0	6	0	3,172	3,390	528 66

REVIEWS.

Wireless Telegraphy and Telephony. By C. R. GIBSON. London: Seeley, Service and Co. Price 5/- net.

This is a popular account of the past and present of wireless telegraphy and telephony which assumes no previous knowledge of the subject on the part of the reader. On the whole the author fulfils his aim very successfully, though it is as well to state at once that systems other than the Marconi system hardly receive proportionate treatment. The second objection which is apparent from a preliminary survey of the book is that, although the latter is excellently arranged and produced, its price is too high. It is surely a mistake to bring the price of a work into conformity with that of a series to which it is to be added if the amount of matter which is or can be usefully presented to the reader does not justify this price. In the writer's opinion, the price of this book could and should be at least 30 per cent. lower.

The author is to be complimented on the care and skill with which he leads the reader step by step from elementary facts which are general knowledge, through suitable analogies, to the ultimate goal in view. In Chapter I the reader is given a working conception of ether waves, and made to realise the relation existing between light and "wireless" oscillations. There is a slight laxity of construction in Paragraph 2, p. 22, which implies, at present, that fluorescence is a phosphorescent *substance*, etc.; in several places there are unjustifiable changes in tense in succeeding sentences, which blemishes should be removed at the earliest opportunity. In Chapter II a number of fundamental principles, including the nature of electric discharge and the meaning and action of electromagnetic induction, are dealt with in a manner that should easily be followed by the lay reader, yet which introduces no serious technical inaccuracy. The electronic theory is clearly explained in simple language in Chapter III, but the author seems here to wander considerably outside the bounds of strictly pertinent matters; the matter actually presented is excellent, but a considerable percentage of the space occupied by this chapter might profitably have been devoted, say, to a more extended description of methods and apparatus, and a treatment of the applications of wireless telegraphy.

Chapter IV is devoted to an account of early proposals and experiments, and as one reads this and the two following chapters (which deal respectively with the advent of true wireless telegraphy and with Sir William Crookes's remarkable forecast in 1892), one is more than ever impressed and saddened by the extraordinary series of accidents by which—from the date of Faraday's induction experiments in 1831, to Thomson's experiments in 1874, Hughes's wireless communication in 1879, and Lodge's remarkable work in the nineties—the immediate commercial application of known facts and methods was overlooked. It has been said that we are a nation of fortunate blunderers, but our blunders—if this be not too harsh a word in this connection—are not always fortunate as regards the commercial application of scientific research. Nevertheless, we can now read with no more than a feeling of regret for opportunities missed, the author's graphic description of the work of Faraday, Morse, Lindsay, Preece, Maxwell, Hughes, Hertz, Lodge, and others. Following excerpts from the extraordinary prophecies by Crookes in 1892, we are presented with a pleasing description of the advent and rapid preliminary successes of Marconi. The first indications of the services which wireless telegraphy were to render in saving life at sea were given fifteen years ago, when mishaps to the East Goodwin Lightship were reported promptly by this means.

In Chapter IX the author considers what other inventors were doing at this time, and presents a brief description of the Lodge-Muirhead, Slaby-Arco, Braun-Siemens, and De Forest systems as used at the end of the nineteenth century. The use of wireless during the Boer War is recalled, as well as the fact that in 1892 the maximum distance of wireless transmission was 100 miles, whereas the Atlantic was bridged three years later. How this further rapid advance was made is discussed in Chapter X, the subjects covered being tuning, the production of lightly damped oscillation and the magnetic, electrolytic and barretter detectors. The stations and apparatus first and now used to bridge the Atlantic form the subject of Chapter XI. "Other Systems" are dealt with in the dozen pages forming Chapter XII. This brevity is rather unfair, and we would suggest that in a later edition the author should elaborate this section of his work, and include, say, two more chapters dealing with methods of recording wireless messages and with actual and potential applications of wireless communication. We find no mention of the important time and weather services now in regular operation, and the applications of wireless telegraphy to fishing fleets, and to wireless "beacons," etc., are surely worth treatment in a popular volume.

Chapters XIII and XIV deal with the general principles of telephony and of wireless telephony; the treatment given is brief (2½ pp. and 5½ pp.), but very useful considering the small space occupied. Chapter XV comprises a useful chronological index of the evolution and development of wireless telegraphy, and in the Appendix is given a glossary of terms. The outstanding criticism concerning this excellent work is that its scope should be widened somewhat or its price reduced.

Modern Electrical Theory. By Norman Robert Campbell, Sc.D. London: Cambridge University Press. Price 9/- net.

Though this is a second edition it is really a new book. The great increase in our knowledge of radiation effected during the last six or seven years has necessitated the rewriting of nearly the whole of it. It is written for the man who has a sufficient acquaintance with the older physics and who desires to study in detail the more modern developments. Its chief concern is not with facts; it attempts to clothe the results of modern experimental work with a suitable garb of theory.

Electrical theory of to-day differs little in change or progress of idea from what it was six years ago. The electronic hypothesis is just as firmly established, but we have greater knowledge of where to look for difficulties attending it. The book under review takes these difficulties firmly by the hand and endeavours, by a comprehensive look round, to account for them. It opens with a discussion on the properties of electricity and deals with Faraday's theory, Maxwell's theory, and the electron theory. Then dielectrics are taken up and Lorentz's theory, refraction of light, dispersion, selective reflection and the consequences of applying the electronic hypothesis to these discussed. Thereafter we have a summary of the properties of electrolytic and metallic conductors, worked out on the electron theory, due consideration being given to such phenomena as the Peltier effect, the Thomson effect and the Hall effect. Gaseous conduction comes next, and this is taken up and discussed by the help of the most modern experimental research, that of Sir J. J. Thomson on positive rays being prominent. Bragg's work also receives here, as throughout the book, full consideration. Magnetic susceptibility and magneto-optics are then touched upon, and this concludes Part I of the work.

Up to this point the author has endeavoured to explain in terms of the electronic theory the electrical and magnetic properties of material substances. The results arrived at are much as would be expected, namely:—

(1) That electric charges are distributed discontinuously.

(2) That the charge of any particle is a multiple of a universal unit.

(3) That there are charged particles which are common constituents of all bodies.

(4) That the mass of these particles is very much less than that of any atom.

(5) That the charge on these particles is -4.7×10^{-10}.

Part II deals very fully with radiation. Indeed, the subject is here treated in much more detail than we remember seeing it elsewhere. All theories are taken up in turn and investigated by the aid of mathematics and experiments on radio-activity. The chapter towards the end of the book on the structure of the atom will perhaps be of greatest interest to those who deal with the practical applications of electricity, and at the same time desire to keep abreast of modern conceptions. A few of the points enunciated about the atom, as deduced from the comprehensive treatment the work gives to the subject, may be stated as follows:—

(1) It is probable that the whole number of electrons in any atom is not very different from that expressing its atomic weight when that of hydrogen is taken as unity, and that the number increases regularly with the atomic weight and is not a periodic function of it.

(2) In every atom there are a few electrons differing greatly from the rest in the way in which they are attached to the atom. These are more easily detached from the atom. The author calls them "valency electrons," and the others "fixed electrons."

(3) The atom does not consist wholly of electrons. It contains a positive charge equal and opposite to the sum of the negative charges on all the electrons.

(4) There are two chief hypotheses to account for (3). (a) The positive charge is distributed uniformly throughout a sphere the radius of which represents the "radius of the atom"; (b) the positive charge is concentrated on a single particle round which the electrons are arranged.

(5) Helium being a product of the disintegration of all the known radio-active elements, the structure of the helium atom is involved in that of all atoms.

Stark's theory that a chemical combination between two atoms represents not a direct attraction of one atom for the other, but a simultaneous attraction of both atoms for the same electron, which thus forms a bond between the atoms, is fully discussed and several interesting diagrams are given.

The work can be thoroughly commended to all those who, having a sufficient knowledge of mathematics and physics, desire to bring themselves right up-to-date in the fascinating realm of the structure of matter and of electricity.

A New Era in Chemistry. By Harry C. Jones. London: Constable & Co., Ltd. Price 8s. 6d. net.

The period fixed for the New Era begins in 1887, the year in which the first volume of the Zeitschrift fur physikalische Chemie was published. This volume contained the well-known papers of Van't Hoff, on the "Relations between Solutions and Gases," and Arrhenius on the "Theory of Electrolytic Dissociation." The year 1887 therefore saw the birth of the new science of physical chemistry. The chemistry of to-day has progressed considerably from that of twenty-five years ago, the difference being most marked in the methods of correlating

this science with its neighbours, especially physics and mathematics. Before the New Era, a student of chemistry was occasionally initiated into the mysteries of physics, but the two sciences were studied as entirely independent subjects. Mathematics was rarely or never introduced into chemistry.

The present volume was written to point out the differences existing between the physical sciences of to-day and those of twenty-five years ago; also the manner in which the development has been brought about. No special appeal is made to any one class, and the book should therefore prove of interest to physical scientists in general. The treatment throughout is comprehensive, only the most elementary chemistry, physics, and mathematics being discussed. Not only is the subject of the simplest, but the author's style is free and easy.

The book begins with a discussion of the condition of chemistry in 1887, and gives a brief outline of the introduction of Mendeléeff's periodic system, Kekule's theory of the constitution of carbon compounds, and other similar modern conceptions of this science. Chapter 2 gives the historical development of the law of Mass Action, and chapter 3 deals almost entirely with Thermo-chemical data. The four following chapters are devoted chiefly to the work of Van't Hoff, whose epoch-making papers are now known to all students of physical sciences. Chapter 8 gives the historical data leading up to Arrhenius' Theory of Electrolytic Dissociation. Chapter 9, which gives a résumé of the author's work, is extremely interesting, but the matter is scarcely of sufficient importance to rank with the writings of the great scientists. The author, however, places great emphasis on the importance of his own work. The next two chapters are devoted to the researches of Ostwald and his students. The amount of work covered by these pioneers is really astounding, and it may be safely said that no single scientist has ever made his influence felt in such a marked manner as Ostwald. Ostwald was undoubtedly the father of Electro-chemistry, and the Leipzig School under his direction became the birthplace of most of the modern conceptions of this New Era. The final chapter deals with Radiochemistry and the new electron theory, which are dealt with in a very able and interesting manner, and show the trend of modern research. The subject is undoubtedly a difficult one, but the author deals with its salient points in such a manner that it appears quite simple. A short appendix is also added, which describes the personal appearance and general characteristics of the great scientists Mendeléef, Kekule, Gibbs, Ramsay, Van't Hoff, Arrhenius, and Ostwald. This is a very interesting addition, and gives a personal touch to the volume.

The book contains very few blemishes, but some of minor importance have been noted. On page 52, while discussing the work of Le Bel on the optical activity of tartaric acid, the author has confused the reason for the inactivity of the meso acid with the inactivity of the racemic acid. Again on page 123, the writer ignores the fact that there is still a school of scientists who do not accept the Theory of Electrolytic Dissociation; in fact, some advanced chemists pin their faith entirely to a Theory of Association. The explanation of the action of pure zinc on sulphuric acid (see pages 189-190), is by no means clear. Pure zinc refuses to dissolve in pure sulphuric acid, in spite of its high solution tension, the reason being that zinc is a metal of high super tension, as has many times been proved by different authors. The views given by the writer, however, are somewhat confusing. The method of separating metals according to their decomposition values (page 242), was worked out in a practical form by Sand. The discovery of argon is attributed to Sir William Ramsay (page 284), as the result of Lord Rayleigh's determinations of atmospheric nitrogen. It should be remembered, however, that Lord Rayleigh also discovered argon by methods quite independent of Ramsay's. There is an obvious error on page 294. While discussing the radio-activity of certain metals, it is stated that some of them, such as potassium and radium, have been shown to be slightly radio-active. The word radium is evidently out of place. These small errors, however, are of minor importance, and in no wise detract from the value of the book. The writer has presented a volume of surpassing interest, and quite up to the standard of his previous publications. The interest is sustained from cover to cover, the book reading more like a novel than a scientific publication. It is written in a manner suitable for scientists in general, and requires no great knowledge of physical chemistry for its complete understanding. It should, therefore, appeal to a very large number of students, whose outlook on the view of chemical science will be materially enlarged thereby. The best thanks of all scientists are due to the author for this valuable contribution.

Soft Soldering, Hard Soldering and Brazing. By J. F. Hobart. London: Constable & Co., Ltd. Price 4/- net.

Although apparently a simple operation, demanding little skill and easily learnt, the art of soldering covers a wide field and affords scope for a high degree of intelligence and technical achievement. It also presents opportunities, especially in electrical work, for bungling and inefficiency which result in the execution of jobs to all outward appearance sound and workmanlike, yet rotten at the core. How many a cable-end has been imperfectly sweated into a terminal lug, with consequent heating and separation, resulting in a switchboard fire! To prevent such mishaps there is nothing so effectual as a course of instruction at the hands of a qualified teacher; failing this, however, those who desire to acquire a sound knowledge of the subject cannot do better than study this book, and practise the various operations at the bench until they are able to turn out a neat and trustworthy job. The author, a man of wide experience, deals with the subject exhaustively, minutely describing the various fluxes and alloys, and explaining how they are employed for all kinds of work. The tools and appliances that are used are also fully described, with the aid of numerous illustrations, specially drawn and lettered to facilitate detailed explanation. The book abounds in "kinks" and sage remarks, and many examples of defective work are shown, as warnings of the consequences of inexpert or careless workmanship. One chapter is devoted to electrically heated tools, of which the author has a high opinion, though he points out that electrical tools must be handled carefully and that trouble with them is the fault not of the tools but of the user.

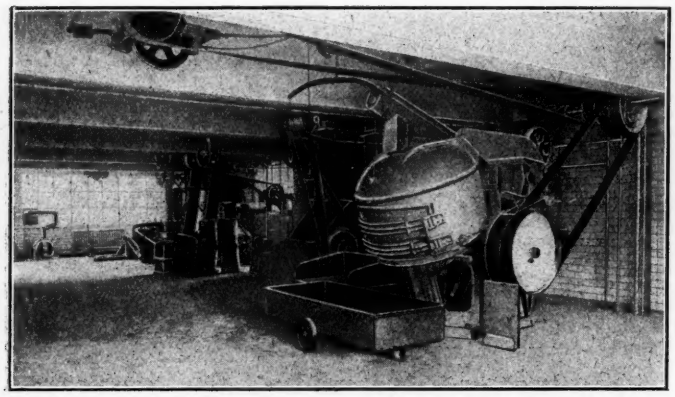
The substance of the work has evidently been published in serial form in some periodical, for we find references to the "February number," etc., and the table of contents has no relation at all to the numbers of the pages; but a good index, correctly numbered, makes up for this defect, and on the whole we can strongly recommend the book.

A Quick Change.—The two electric motors which are used for printing the *Jewish Express* recently broke down, and the owners were faced with the alternatives of stopping printing for two days or sending their paper to be printed elsewhere. In this emergency they approached the Stepney Borough Council's electricity department at 11 a.m. The latter showed its sympathy in a very practical manner, for within three hours a new 9-H.P. British Thomson-Houston motor was in the works, making it possible to continue publication without interruption. The proprietors expressed their very best thanks to the Council for this smart piece of work.

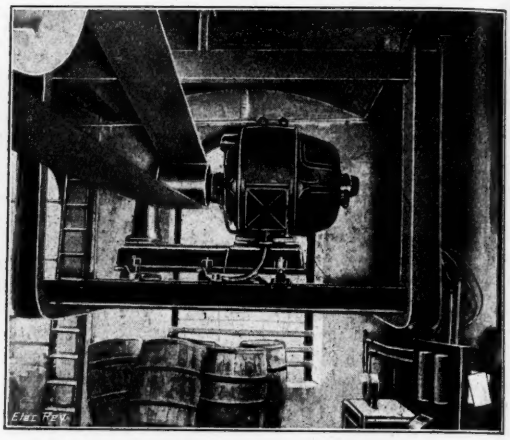
ELECTRICAL EQUIPMENT OF MODERN BAKERIES.

The application of electricity to the baking industry is most desirable in the interests of cleanliness, economy, efficiency, speed, regularity and reliability, and also, since baking operations are generally carried out at night, from the point of view of efficient lighting.

A typical example of this class of work is the bakery of Messrs. J. & B. Stevenson, at Cranstonhill. In one of their bakehouses a 60-B.H.P. motor, by the British Thomson-Houston Co., was installed to replace a steam engine and boiler, thereby saving a great deal of floor space. This motor is suspended by steel hangers from the ceiling of the ground floor, and connected by belting and counter-shafting to two groups of machines, viz.:—



Kneading Machinery, &c., with 30-H.P. B.T.H. Motor Drive.

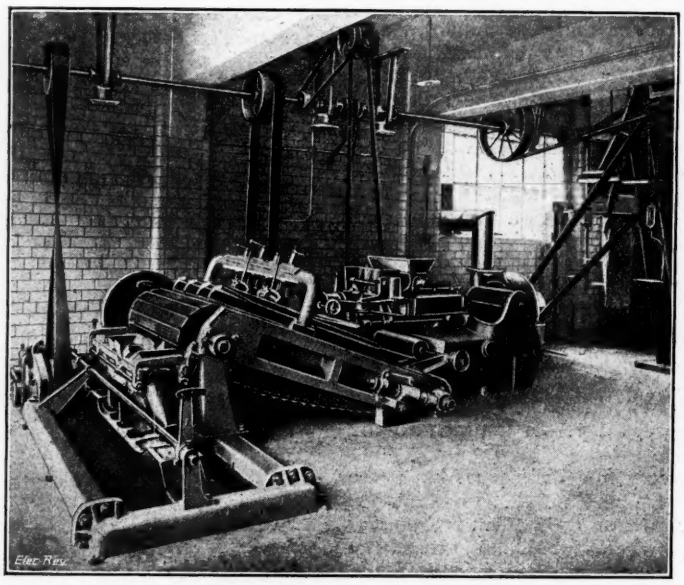


60-H.P. Motor Drive, Cranstonhill Bakery.

Ground floor: Two kneading machines and one dividing and handling machine two stirrers, and a ventilating fan; basement: Two kneading machines and one dividing and handling machine.

It is ultimately intended to install a duplicate motor on a third floor where it will replace a gas engine driving a power lift, two kneading machines, one stirrer, a fruit cleaner, and automatic machines, with provision for its being connected to the main shafting on the lower floors.

In the latest premises of this firm, two floors are completely equipped with electrical drives, and two others are to be similarly equipped at a later date.



B.T.H. Pipe-Ventilated Motor driving Automatic Plant in a Bakery.

Two B.T.H. motors are used, of 30 and 12 B.H.P. respectively, and are of the pipe ventilated type. These are specially designed for use in a dusty atmosphere and are totally enclosed, ventilation being obtained by means of a pipe led outside the building. Airtight glass windows are let into the casing to enable a close view of the commutator and brush gear to be obtained.

The two groups of machines driven by these motors are as follows:—(1) Two kneading machines, flour sifter with elevator and conveyor, and a stirring machine. (2) Automatic plant—chaffing machine, prover and handing-up machines.

By means of a clutch on the counter-shafting, the two groups of machines may be connected together so that either motor alone may be utilised to drive the automatic plant and a limited number of the other machines.

Substantial terminal boxes are fixed to the motor frames, and the whole of the wiring between the motors and control panels and the supply is enclosed in metallic tubing, thus eliminating any danger due to flour dust in the atmosphere.

The control panels, which are fitted with no-volt and overload releases, interlocking shunt regulators and fuses, thus effectively protecting the motors from injury due to careless starting, &c., are enclosed in glass-fronted cast-iron cases, through which the control handles project.

Special push-button switches are fitted beside the handing-up machine of the automatic plant to enable the attendant to stop the machine immediately, if necessary.

The supply is obtained from the three-wire system of the Glasgow Corporation. The incoming leads are connected to a main switchboard in the basement, where connections may be made to distribution boards situated at convenient central positions on each floor.

Satisfactory lighting is obtained by the use of 30-watt 250-volt metal-filament lamps connected between the outers and the neutral, while the motors are connected across the 500-volt outers.

In addition to the fact that the electric drive offers the best conditions for clean and efficient work, the low cost of such an installation as that described above should be a strong recommendation for its adoption.

It is always difficult to obtain reliable information as to the relative cost of various methods of power supply, but statistics issued by the Corporation Electricity Department show that the cost of current supplied to bakeries in Glasgow and Birmingham during 1913 was as low as £1 19s. and £1 15s. 7d. respectively per H.P. installed.

The above schemes were adopted on the advice of Messrs. James E. Sayers & Caldwell, consulting engineers, of Glasgow, who prepared the necessary specifications and supervised the work.

Aluminium in Norway.—The Norwegian Nitride Co. has erected a new manufactory at Eydehavn, near Arendal, for the production of aluminium. The factory has now been completed, and work was started at the end of April last. The amount of electrical power required for this concern is 10,000 E.H.P. The company has recently increased its capital to £555,555, and it is reported to have the intention of extending the aluminium factory with the view of raising the production to double the present output. It is further proposed to erect a factory for the manufacture of electrodes, for which there is now a big market in Norway alone.

SWISS RAILWAY ELECTRIFICATION REPORT.

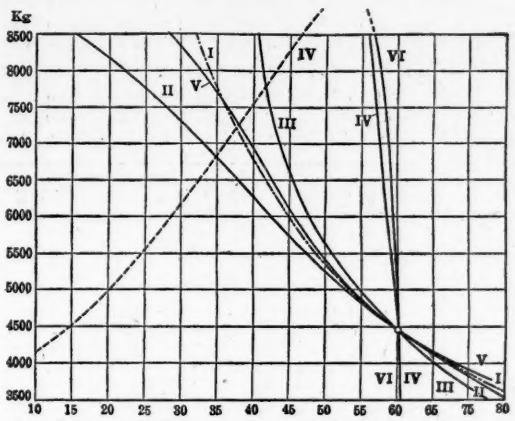
A TRANSLATION in abstract of the report of the Swiss Electrification Commission recently appeared in the *Electric Railway Journal*, from which the following particulars and curves are taken.

The conditions underlying Swiss railway electrification are the use of water power to the greatest advantage. The systems considered were :—

Direct current with third-rail up to 800 volts and trolley up to 3,000 volts, with the possible ultimate use of a 6,000-volt, three-wire system. Three-phase alternating current with two overhead lines having 5,000 volts to 8,000 volts between phases and a frequency of 15 cycles.

Single-phase alternating current with line voltage at 15,000 volts and a frequency of 15 cycles to 25 cycles.

The following limits were considered admissible for the propulsion apparatus itself : Direct current, 1,500 volts per commutator and 3,000 volts per motor ; single-phase, 300 volts to 500 volts for purely series motors and 6,000 volts for motors without commutators. A frequency of 15 to 45 cycles was held admissible for three-phase motors.



I—Ideal motor of constant output ; II—Steam locomotive ; III—D.C. series motor ; IV—D.C. shunt-wound motor ; V—Single-phase motor ; VI—Three-phase induction motor.

FIG. 1.—MECHANICAL CHARACTERISTICS OF DIFFERENT MOTORS WITH THE SAME NORMAL TRACTIVE EFFORT AND NORMAL SPEED.

The report states that any of the three systems would be capable of hauling trains of any desired length. The possibility of speed variation is then considered, and the curves (figs. 2, 3, 4 and 5) are produced to demonstrate that the single-phase motor is the most efficient in giving the desired range of speeds and tractive efforts without loss in resistance. Further, the single-phase commutator motor is the only one which, because of transformer control, can maintain the service despite extremely heavy drops in voltage. It is superior to the D.C. motor and equal to the three-phase motor in operating at the maximum speed permissible on grades. The possibility of making up time is another advantage of single-phase apparatus, even if it is not the cheapest. It is true that an increase in speed could be obtained with D.C. field-control motors or with three-phase induction motors by using a special resistance, but the single-phase motor is the one that meets this condition to the greatest satisfaction.

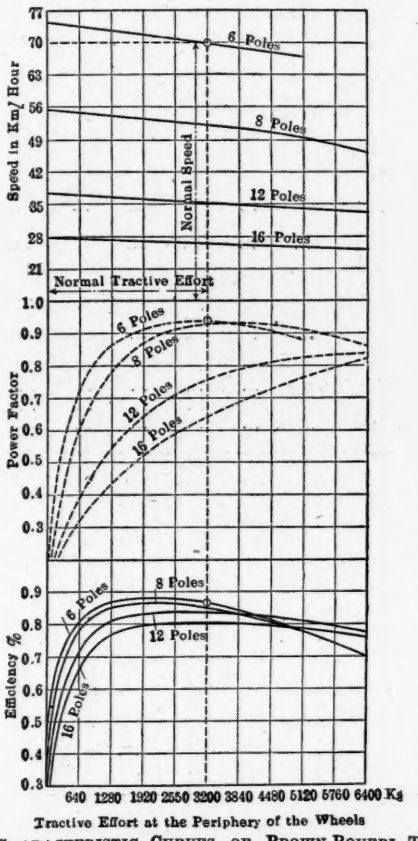
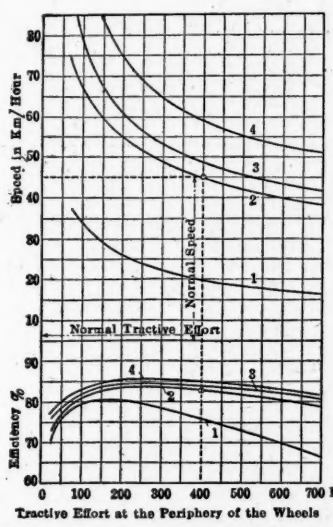


FIG. 2.—CHARACTERISTIC CURVES OF BROWN-BOVERI THREE-PHASE INDUCTION MOTOR, 850 H.P., 3,000 VOLTS, 15 CYCLES, WITH FOUR CHANGES OF POLES.



1—Connected in series ; 2—connected in parallel ; 3—connected in parallel with 30 per cent. of current in shunt ; 4—connected in parallel with 60 per cent. of current in shunt.

FIG. 3.—CHARACTERISTIC CURVES OF ALIOTH D.C. SERIES MOTOR, 66·5 H.P., 750 VOLTS.

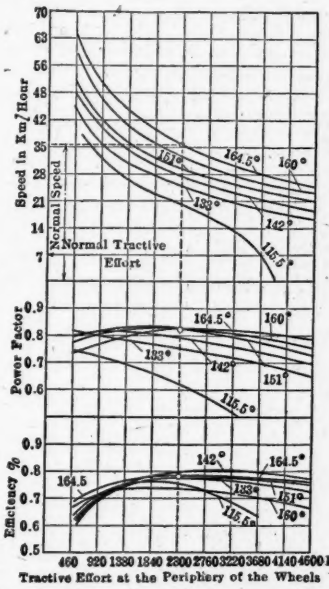


FIG. 4.—CHARACTERISTIC CURVES OF DERI TYPE BROWN-BOVERI SINGLE-PHASE MOTOR, 300 H.P., 1,000 VOLTS, 16⅔ CYCLES, WITH SIX BRUSH POSITIONS.

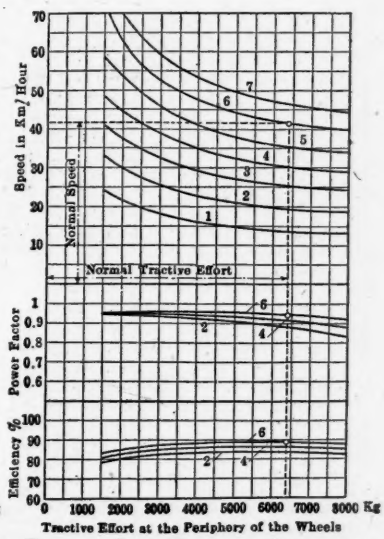


FIG. 5.—CHARACTERISTIC CURVES OF OERLIKON SINGLE-PHASE MOTOR, 1,000 H.P., 500 VOLTS, 15 CYCLES, WITH SEVEN VOLTAGE STEPS.

taken on a one-hour basis. A curve has also been calculated for an ideal motor of constant output, namely, one which would exert a uniform demand on the hydroelectric plant. Table I gives some examples of tractive efforts and the corresponding energy requirements of the motors represented in the curves of figs. 2 to 5 inclusive. Assuming that the energy required for acceleration is double that for normal running, it is found that the three types of motors are fairly equal in efficiency, but the single-phase motor calls for the least energy output from the hydroelectric station.

It was considered preferable to compare the motors on the basis of torque rather than horse-power, because the latter varies so much with speed. Table II is a comparison of the three systems, indicating that their dead weight is much less than steam equipment. It also shows that they do not differ materially from one another, the slightly higher weight of single-phase equipment being considered an advantage in speed regulation. The report also points out that the system should be considered as a whole, and that the actual efficiency of motors of the same output in the same service does not vary much, despite differences in system of energy supply.

TABLE I.—TRACTIVE EFFORT AND POWER TAKEN BY DIFFERENT TYPES OF MOTORS.

	Tractive effort in percentage of normal effort					
	50	100	150	200	250	300
Alioth motor, type G.T.M. 65, 750 volts, 65 H.P., one-hour basis.						
Consumption in KW. of the motor alone	2·4	4·7	7·0	9·4	11·7	14·0
Consumption in KW. of the motor and resistances for acceleration at constant and normal voltage	10·0	14·8	16·1	18·6	22·0	24·0
Three-phase locomotive motor, Brown, Boveri & Co., type D-16-6, 500-320, 16 cycles, 3,000 volts, 350 H.P., one-hour basis.						
Consumption in KW.	210	420	630	840	1,050	1,260
Consumption in kv.-ampere	320	640	960	1,280	1,600	1,920
Power factor	0·655	0·655	0·655	0·655	·0655	·0655
Single-phase commutator motor, Deri type, Brown, Boveri & Co., 16 2/3 cycles, 1,000 volts, 300 H.P., one-hour basis.						
Consumption in KW.	65	92	122	154	190	228
Consumption in kv.-ampere	265	395	530	670	810	950
Power factor	0·24	0·24	0·24	0·24	0·24	0·24
Series commutator motor, Oerlikon type, 12 WB, 15 cycles, 500 volts, 100 H.P., one-hour basis.						
Consumption in KW.	20	60	97·5	140	190	250
Consumption in kv.-ampere	138	280	420	560	700	860
Power factor	0·15	0·19	0·23	0·25	0·27	0·29

TABLE II.—WEIGHT OF MOTOR PER H.P. OUTPUT AND TORQUE IN METER-KILOGRAMS.

	D.C.	*Three-phase.*	*Single-phase.*
Electric locomotives for speeds of 40 to 60 km. per hour.	50-55 kg./H.P. 11 mkg.	45-60 kg./H.P. 10-12 mkg.	50-75 kg./H.P. 11-13 mkg.
Motor-car equipment for speeds of 40 km. per hour.	28-30 kg./H.P. 6-7 mkg.	30-35 kg./H.P. 7-8 mkg.	30-35 kg./H.P. 7-8 mkg.

The characteristic curves in figs. 2 to 5 are based on the assumption that the speed regulation of the different motors is obtained without resistance losses; therefore, for D.C. and three-phase operations only a limited number of speed steps would be obtained, and it would be impossible to avoid the use of resistance if better regulation were wanted. Thus, if the total efficiency based on complete runs is considered, both D.C. and three-phase motors lose whatever superiority they might have if a limited number of fixed speeds were permissible. The Commissioners arrive at the following values of efficiencies of entire trains:—Direct current, 70-80 per cent.; three phase current, 65-70 per cent.; single-phase current, 68-75 per cent.

The efficiency of the transmission and feeder contact lines is much the same for the three systems.

According to calculations, it was found that the ratio between minimum and maximum energy requirements is 1 : 3·5, and on this basis the superiority of the single-phase system was agreed on, in view of the necessity of equalising hydro-electric demands.

The series motor is preferable because, instead of taking more energy on up grades, it simply decreases in speed.

In theory, regeneration would seem to be of great importance in a mountainous country like Switzerland. In reality, regeneration in the form of braking is but a very small part of the total requirements, while regeneration in the form of liberated energy is of importance only on really severe grades which do not obtain generally on the trunk lines. The estimated energy saving of 4 per cent. would not be great enough to justify regenerating apparatus on D.C. rolling stock, although its application to the A.C. systems might still be considered.

The reliability of the line is considered even more important than the reliability of the propulsion equipment, because disturbances on the former cripple the entire system, whereas disturbances on the latter cripple merely the individual train.

The third rail is substantial, easily accessible, less obstructive than an aerial line, and free from wind troubles; but it is difficult to maintain the third-rail covering, and impossible to use it when very high voltages are employed, because of the danger to employés and passengers. On the other hand, overhead lines have been developed to such a degrée of reliability, that their construction and maintenance for high-tension work offer no disadvantages.

Finally, in comparing aerial lines themselves, the single-phase trolley is certainly preferable to the double trolley of three-phase lines.

The possible influence of propulsion currents on near-by telephone and telegraph circuits received careful attention.

The Commission states that there is no important difference in the influence of each system on weak-current circuits as a whole.

The choice of frequency for single-phase operation was based upon the most efficient ratio, namely, 1 to 3, which could be obtained if it was necessary to install frequency changers. From existing 40-cycle and 50-cycle central stations a frequency of 13½ cycles to 16⅔ cycles, or an average of 15 cycles, could thus be secured.

Considering all technical features, the Commission concludes that the single-phase system is the one most advantageous for Swiss conditions.

When the first comparisons were made no definite figures were available on the unit costs of energy at the power stations, but more detailed calculations later showed that the relations between the systems were not changed by more exact generating costs.

In general, it was found more advantageous for all systems not to use a storage battery power station auxiliary. The cost of energy for single-phase operation is less than for direct-current or three-phase. To remove all doubt, the comparative costs of car equipment were also considered. The Commission concluded that the most advantageous system is single-phase, 15 cycles, with 10,000 to 15,000 volts on the contact wire.

TABLE III.—EFFICIENCY IN PERCENTAGE OF THE THREE SYSTEMS ON DAILY AND ANNUAL BASIS.

	D.C.	*Three-phase.*	*Single-phase.*
Trains	70 to 80	65 to 75	68 to 76
Contact lines and rails	94 „ 98	94 „ 98	94 „ 98
Transformation in rotating equipment.	70 „ 90	94 „ 98	94 „ 98
Transformation in static equipment—			
Old transformers	70 „ 90	(70 „ 80)	(80 „ 90)
Recent transformers ...	70 „ 90	80 „ 90	90 „ 95
H.T. transmission lines	90 „ 95	90 „ 95	90 „ 98
Net efficiency from the generating plant to the wheels of the vehicle.	42 „ 67	44 „ 63	53 „ 63

Although the primary object of the electrification is to free the Swiss railways from the necessity of importing coal, it is expected that train speeds will be increased also. Complete data was worked out for the St. Gothard line. The estimated increase in carrying capacity by electric haulage is 185 per cent. as compared with the average steam traffic of 1904, and 130 per cent. as compared with the same for 1907. The corresponding increases in maximum traffic would be 255 and 150 per cent. respectively. The electrical maxima are near the ultimate capacity of the St. Gothard line. The total estimated cost of this installation is 67½ million francs, of which 29 million francs represents power station and distribution expenditure. The route is about 160 km. long.

Employers and Evening Institutes.—Writing to the *Times* regarding the work of the London County Council Education Committee's report respecting the increased attendances at the Junior Commercial and the Junior Technical Institutes, Mr. George Sutton states that his company, W. T. Henley's Telegraph Works Co., Ltd., has for several years made it a condition of employment in London offices that lads under 18 years of age should attend evening classes; the present record of the office is that out of 33 lads under 18, 25 are attending evening institutes.

ELECTRICAL TERMS AND DEFINITIONS.

Soon after the formation of the International Electrotechnical Commission, the British National Committee appointed a Nomenclature Committee, which proceeded to consider and draft definitions of the electrochemical terms in current use in the English language. In our issues of August 7th and 14th, 1908, we printed the first instalment of the list of terms and definitions, and further instalments were published in our issues of August 16th and 23rd, 1912, bringing the list up to and including the letter Q. The Committee has now completed the first set, which was published in the *Journal* of the Institution of Electrical Engineers on May 1st. The definitions are not identical with those which were approved by the Nomenclature Committee of the International Electrotechnical Commission at the Berlin meeting last year, the intention of the British Committee being to put on record the usage in this country; it is hoped that the next revision will bring the two lists more nearly into line. The present list, therefore, must not be taken as final, and the Committee will be glad to receive suggestions (addressed to the Secretary of the Institution) which will tend to eliminate errors and to set up standard definitions which may be definitely accepted in this country.

Comparing the present complete list with the instalments that we have already published, we have noted cases where material changes have been made in the definitions, and we reproduce these below, together with supplementary items, followed by the terms and definitions from R to Y, which we have not previously published.

Active Current.—Component of the current in phase with the voltage.

Alternator.—A generator producing alternating electromotive forces and currents, either single-phase or polyphase. An alternator may be described as a single alternator, a two-phase alternator, a three-phase alternator, &c. The exciting current is generally supplied by a separate machine called an exciter. (The word Dynamo is usually reserved for a continuous-current generator.)

Ammeter or Amperemeter.—An instrument with a scale graduated in amperes for measuring the value of an electric current.

Ampere-Hour.—A practical unit of quantity of electricity. One ampere for one hour, or its equivalent, such as four amperes for 15 minutes, &c. One ampere-hour is 3,600 coulombs.

Anion.—The ion which is carried to the anode.

Antikathode.—A target hit by the kathode rays in a vacuum tube.

Apparent Power.—In an alternating-current circuit the product of volts and amperes.

Arc.—A luminous discharge of electricity through a gas in which the material of one or both the electrodes is volatilised and takes part in the conduction of the current whether continuous or alternating.

Armature (*a*) of a generator or motor.—That part of the machine which consists of active windings, core, and supports, and which is acted upon inductively by the magnetic flux. In the case of a generator it supplies the main current to the terminals; in the case of a motor it receives the main current from the terminals.

Note to (*a*).—In continuous-current machinery the armature usually rotates; in alternating-current machinery it is usually stationary. *See* Stator, Rotor.

Astatic.—A system of magnets or coils is said to be astatic when the polarities of its parts are so adjusted that no directive effect is exerted on the system by a uniform magnetic field.

Balancer.—A motor-generator or accumulator used to equalise differences of potential between the different wires of a multiple-wire system.

Calibrate.—To mark the scale of an instrument, or to adjust the instrument to conform with the scale. (Sometimes used as the equivalent of "to verify." Not recommended.)

Candle-Power.—A measure of the luminous intensity of a source of light in a given direction.

Capacity.—(*a*) Of an accumulator. The quantity of electricity in ampere-hours which may be taken from a cell, at a given rate of discharge.

(*b*) Of a condenser. (1) Electrostatic. The capacity of a conductor at an infinite distance from other conductors is the quantity of electricity that must be imparted to it in order to raise its potential from zero to unity, *e.g.*, the capacity of a sphere equals its radius.

(2) The self-capacity of an insulated conductor is the charge on the conductor when its potential is unity, all the other conductors in the field being at zero potential. If the position of any of the other conductors is altered, the self-capacity will generally be altered also. Maxwell called this the capacity of the conductor and also the coefficient of self-induction of the conductor for electrostatic charges.

(3) The mutual capacity between two insulated conductors when all neighbouring conductors are at zero potential is the induced charge on either of them when connected with the earth, the other being maintained at unit potential.

(2) and (3) are also called the capacity coefficients.

(4) The capacity between two insulated conductors when all neighbouring conductors are at zero potential is numerically equal to the charge on either of them when the potential between them is unity, and they are given equal and opposite charges. This is the capacity in general use by electrical engineers; *e.g.*, the capacity of a concentric main, the capacity between two overhead wires, between two cores of a multicore cable, &c. Many useful formulæ for this capacity are known.

(*c*) Of a machine or of a generating station. This use of the word capacity is not recommended. The term Rating should be used.

Catenary.—In railway work. A wire or cable from which electric wires or cables are hung. See Messenger.

Contact Resistance.—A quality acting like a resistance which appears at the surface of contact between two conductors (*e.g.*, as between brushes and commutator or slip-rings).

Contact Ring.—A conducting ring for effecting a connection between a revolving conductor and a fixed conductor, as in a crane, a searchlight, a ship's turret.

Continuous Running.—Running for such a time, under specified conditions, that the final state is sensibly attained.

Copper-Loss.—The total losses in the copper windings.

Corona.—The luminous discharge which appears round a conductor when its potential exceeds a certain value, depending on barometric pressure, the diameter of the conductor, &c.

Dielectric Rigidity or Dielectric Strength.—The property of a dielectric to resist the passage of sparks. (In practice, measured in volts per centimetre under specified conditions.)

Disruptive Voltage.—Difference of potential producing a spark discharge.

Electrolysis.—The decomposition which takes place when an electric current passes through a chemical compound.

Excitation.—(*a*) Production of the magnetic flux in an electromagnet by means of an exciting current.

(*b*) Number of ampere-turns producing the flux.

Note.—The excitation may be produced by several windings traversed by different currents.

Frequency.—Reciprocal of the time for a complete period of a periodic quantity. In practice, the number of periods per second.

Gauss.—A name given to the absolute electromagnetic unit of magnetic force in the C.G.S. system. *See* Field, Magnetic, and Line.

Grid.—(*a*) In an accumulator. The framework supporting the active material.

(*b*) A form of cast or stamped resistance.

High Tension.—Term sometimes used for High Pressure.

Induction, Magnetic.—(*a*) When a mass of iron, &c., is brought into a magnetic field, thereby causing magnetic poles to appear on the mass, these poles are called Induced Poles, and the magnetism so acquired is called Induced Magnetism; and the operation is termed Magnetic Induction.

(*b*) When a uniform magnetising force H acts on a medium it produces a flux of induction, the density of which is B. Flux of induction is also called Magnetic Flux. The ratio B/H gives the permeability of the medium for the value H. The unit line of magnetic induction (the Maxwell) is called a Magnetic Line.

Inductive Circuit.—A circuit in which the reactive effect of self-induction at the working frequency or at make or break is appreciable compared with its resistance.

Input.—The total power received at the shaft or terminals of a machine or apparatus.

(*a*) Power supplied to a generator or transformer.

(*b*) Power supplied to the terminals of a motor.

Insulance.—A term proposed in place of the expression Insulation Resistance.

Insulation.—(*a*) Process of insulating.

(*b*) Material employed to insulate.

(*c*) Quality resulting from the process.

Insulation Resistance.—The resistance of the insulation between two conductors or systems of conductors, or between a system of conductors and earth. (Usually expressed in megohms.)

Interpole.—An intermediary pole placed between the principal poles of a machine to assist commutation.

Lagging Load.—Any load on a machine or apparatus in which the phase of the current lags behind that of the voltage at the terminals.

Magnet, Permanent.—A body which having been magnetised retains a substantial portion of its magnetisation.

Magnetic Force.—The force at any point in a magnetic field experienced by a unit pole placed at that point, divided by the permeability of the medium; sometimes called Field Intensity or Strength of Field.

Magnetic Line.—The unit (*a*) of magnetic flux **B**, or (*b*) magnetic induction **B**. The rate at which the number of magnetic lines linked with a circuit alters equals the electromotive force induced in the circuit.

Magnetic Susceptibility or Magnetisability. — The number obtained by dividing the intensity of magnetisation by the magnetic force producing it.

Magnetisation.—The process or result of communicating magnetism to a body.

Magnetometer.—An instrument for measuring the magnitude and direction of magnetic force.

Maxwell.—The name given to the magnetic line of force or (*a*) unit of magnetic flux, (*b*) unit of magnetic induction.

Network.—A system of conductors consisting of mains, feeders, and distributors interconnected for the distribution of electrical energy in a supply system.

Load.—(*c*) Any load on a machine or apparatus in which the current is in phase with the voltage at the terminals.

Over-compounded.—A compound-wound generator or motor is said to be over-compounded (*a*) when the potential difference between its terminals increases with the load; (*b*) when the speed increases with the load.

Polyphase.—A supply is said to be polyphase when it consists of alternating currents displaced in phase with regard to one another by equal portions of a period.

Power Factor.—The ratio of the watts to the volt-amperes. In the case of voltage and current of sine form the power factor is cos ϕ.

(*To be continued.*)

LEGAL.

THE CONSOLIDATED LANGLAAGTE MINES, LTD., *v.* THE VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.

THIS action was commenced in March last in the Supreme Court, Johannesburg, before Mr. Justice Ward. Plaintiffs claimed an amount of £42,104 for breach of agreement in connection with the supply of electric power. The claim was made up as follows:—Loss in extraction, £4,080; deferred profits, £27,833; loss on developments, £6,910; loss on shaft sinking, £3,281; total, £42,104. The action depended primarily on agreements entered into between the parties in January, 1909, and January, 1910. It was claimed by plaintiffs that under these agreements defendants undertook to supply additional power on certain conditions. The condition for an additional supply, not exceeding 2,000 KW., was 15 months' notice. On February 25th, 1911, it was alleged that proper notice was given for an additional supply to operate new reduction works about to be installed of 1,200 KW. at 525 volts. On March 6th it was claimed the defendants agreed to supply this additional power, which would be due on July 1st, 1912. Defendants, however, it was stated, did not commence delivery before September 29th, 1912. Plaintiffs claimed that by reason of this alleged failure they were for a period of three months, from July 1st, 1912, to September 30th, 1912, unable to extract gold as completely and effectively as they could have done had the power been supplied, the profits which would otherwise have been made had been deferred, and there had been consequent loss in development and shaft sinking.

The defendants pleaded that they were not obliged to supply additional power till such power was *bonâ fide* required. Under a clause of the first agreement, in the case of an additional supply exceeding 2,000 KW., but not exceeding 3,000 KW., defendants were not obliged to give such supply, except after 18 months' notice, and in case of an additional supply exceeding 3,000 KW., defendants were not obliged to give such supply except in accordance with arrangements to be mutually agreed upon between them and the Johannesburg Consolidated Investment Co. It was contended that the notice of February 25th, 1911, was not duly given in terms of the agreement by reason of the fact that the additional supply was not required *bonâ fide* by the plaintiffs within the meaning of the agreement. Alternatively, it was contended that if the notice was given in terms of the agreement, the total additional supply by the plaintiffs in terms of the notice of February 25th, and of other notices, exceeded 3,000 KW., and defendants were accordingly not bound to give such additional supply, or any part thereof, except in accordance with arrangements to be mutually agreed between defendants and the Johannesburg Consolidated Investment Co. It was admitted that the defendants did not commence the supply of the additional 1,200 KW. till September 29th, 1912.

MR. JUSTICE WARD gave judgment on May 14th for the plaintiffs for £36,268 19s., which was allocated under the following heads:—(1) Loss in extraction, £4,233; (2) deferred profits, £25,750; (3) extra cost in development, £4,344 19s.; (4) extra cost of shaft sinking, £1,941. From this must be deducted the present value of £25,750 deferred profits at 6 per cent. payable in 22 years.

It is understood that the total amount of damages will be £29,123.

VENNER'S SIGNS, LTD., *v.* STELLAR SIGNS, LTD.

IN the Chancery Division, on Thursday, before Mr. Justice Astbury, MR. F. RUSSELL, K.C., again mentioned this case upon a motion to restrain alleged infringement of patent. He said the other side had handed him a bundle of affidavits, which he had not yet read, and the motion must again stand over. He suggested an adjournment till the first Friday of next sittings—June 12th.

His LORDSHIP assented.

TRADE STATISTICS OF SOUTH AFRICA.

THE following statement, showing the imports of electrical and similar goods into the Union of South Africa during the year 1913, has been taken from the recently issued official trade statistics. The figures for 1912 are added for purposes of comparison, and notes of any increases or decreases are given.

	1912.	1913.	Inc. or dec.
Asbestos manufactures.—	£	£	£
From Great Britain ...	3,000	4,000	+ 1,000
,, Other countries	2,000	4,000	+ 2,000
Total ...	5,000	8,000	+ 3 000
Brass manufactures.—			
From Great Britain ...	37,000	31,000	- 6,000
,, Germany ...	2,000	2,000	—
,, Other countries	2,000	2,000	—
Total ...	41,000	35,000	- 6,000
Copper, plate and sheet.—			
From Great Britain ...	4,000	4,000	—
,, Other countries	—	1,000	+ 1,000
Total ...	4,000	5,000	+ 1,000
Copper manufactures.—			
From Great Britain ...	4,000	5,000	+ 1,000
,, Other countries	1,000	2,000	+ 1,000
Total ...	5,000	7,000	+ 2,000
	1912.	1913.	Inc. or dec.
Electrical cable and wire.—	£	£	£
From Great Britain ...	142,000	170,000	+ 28,000
,, Germany ...	30,000	71,000	+ 41,000
,, Other countries	4,000	10,000	+ 6,000
Total ...	176,000	251,000	+ 75,000
Electrical fittings, including posts.—			
From Great Britain ...	170,000	155,000	- 15,000
,, Germany ...	87,000	67,000	- 20,000
,, Holland	1,000	3,000	+ 2,000
,, United States ...	23,000	30,000	+ 7 000
,, Other countries	8,000	9,000	+ 1,000
Total ...	289,000	264,000	- 25,000
India-rubber of all kinds.—			
From Great Britain ...	33,000	29,000	- 4,000
,, Germany ...	2,000	3,000	+ 1,000
,, United States ...	7,000	3,000	- 4,000
,, Other countries	—	1,000	+ 1,000
Total ...	42,000	36,000	- 6,000
Lamps and lampware.—			
From Great Britain ...	19,000	19,000	—
,, Germany ...	16,000	21,000	+ 5,000
,, United States ...	11,000	15,000	+ 4,000
,, Other countries	1,000	3,000	+ 2,000
Total ...	47,000	58,000	+ 11,000
Machine bands and belting.—			
From Great Britain ...	102,000	100,000	- 2,000
,, United States ...	29,000	37,000	+ 8,000
,, Other countries	2,000	4,000	+ 2,000
Total ...	133,000	141,000	+ 8,000
Electrical machinery.—			
From Great Britain ...	140,000	142,000	+ 2,000
,, Germany ...	238,000	253,000	+ 15,000
,, United States ...	50,000	51,000	+ 1,000
,, Other countries	7,000	5,000	- 2,000
Total ...	435,000	451,000	+ 16,000
Cranes, elevators and lifts.—			
From Great Britain ...	33,000	45,000	+ 12,000
,, United States ...	4,000	11,000	+ 7,000
,, Other countries	2,000	7,000	+ 5,000
Total ...	39,000	63,000	+ 24,000
Mining machinery.—			
From Great Britain ...	483,000	512,000	+ 29,000
,, Germany ...	72,000	74,000	+ 2,000
,, United States ...	128,000	161,000	+ 33,000
,, Other countries	7,000	19,000	+ 12,000
Total ...	690,000	766,000	+ 76,000
Machinery not specially mentioned (other than agricultural, manufacturing, &c.).			
From Great Britain ...	359,000	341,000	- 18,000
,, Germany ...	38,000	39,000	+ 1,000
,, United States ...	45,000	39,000	- 6,000
,, Other countries	12,000	8,000	- 4,000
Total ...	454,000	427,000	- 27,000
Railway rails.—			
From Great Britain ...	13,000	13,000	—
,, Belgium	4,000	1,000	- 3,000
,, Germany ...	51,000	61,000	+ 10,000
,, United States ...	3,000	4,000	+ 1,000
Total ...	71,000	79,000	+ 8,000
Telegraph and telephone material—			
From Great Britain ...	9,000	10,000	+ 1,000
,, Germany ...	1,000	1,000	—
,, Sweden	4,000	3,000	- 1,000
,, United States ...	1,000	1,000	—
,, Other countries	2,000	3,000	+ 1,000
Total ...	17,000	18,000	+ 1,000
Tramway rails.—			
From Great Britain ...	1,000	2,000	+ 1,000
,, Germany ...	7,000	14,000	+ 7,000
,, United States ...	3,000	5,000	+ 2,000
Total ...	11,000	21,000	+ 10,000
Tramway rolling-stock.—			
From Great Britain ...	4,000	16,000	+ 12,000
,, United States ...	2,000	12,000	+ 10,000
Total ...	6,000	28,000	+ 22,000

	1912.	1913.	Inc. or dec.
Other tramway materials.—	£	£	£
From Great Britain ...	9,000	11,000	+ 2,000
,, Germany ...	1,000	1,000	—
,, United States ...	1,000	5,000	+ 4,000
Total ...	11,000	17,000	+ 6,000
In addition to the above the following goods were imported as "Government Stores":—			
Brassware.—			
From United Kingdom	4,000	8,000	+ 4,000
Copper, plate and sheet.—			
From United Kingdom	19,000	20,000	+ 1,000
Electrical cable and wire.—			
From United Kingdom	57,000	63,000	+ 6,000
,, Germany ...	2,000	—	— 2,000
Total ...	59,000	63,000	+ 4,000
Electric fittings.—			
From United Kingdom	14,000	24,000	+ 10,000
,, Germany ...	1,000	2,000	+ 1,000
,, Other countries	—	1,000	+ 1,000
Total ...	15,000	27,000	+ 12,000
India-rubber.—			
From United Kingdom	5,000	4,000	— 1,000
Lampware.—			
From United Kingdom	2,000	4,000	+ 2,000
Cranes and elevators.—			
From United Kingdom	1,000	25,000	+ 24,000
Electrical machinery.—			
From United Kingdom	22,000	12,000	— 10,000
,, Germany ...	—	1,000	+ 1,000
,, France	—	1,000	+ 1,000
Total ...	22,000	14,000	— 8,000
Other machinery.—			
From United Kingdom	58,000	56,000	— 2,000
,, Other countries	4,000	4,000	—
Total ...	62,000	60,000	— 2,000
Railway rails.—			
From United Kingdom	319,000	388,000	+ 69,000
,, Germany ...	53,000	—	— 53,000
,, United States ...	44,000	—	— 44,000
,, Belgium ...	34,000	—	— 34,000
Total ...	450,000	388,000	— 62,000
Telegraph and telephone material.—			
From United Kingdom	88,000	125,000	+ 37,000
,, Sweden	32,000	31,000	— 1,000
,, Other countries	—	1,000	+ 1,000
Total ...	120,000	157,000	+ 37,000
From United Kingdom	—	3,000	+ 3,000

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

DENMARK.—The Danish Customs Authorities have decided that transformers are to be dutiable at the rate of 7½ per cent. *ad. val.*

COLUMBIA.—With reference to the translation of the new Columbian tariff recently published by the Board of Trade, extracts from which were inserted in the ELECTRICAL REVIEW, it is now pointed out that No. 797 of the tariff, which formerly read "lamparas de acero" (lamps of steel), should really refer to "arc lamps" and all lamps for outside lighting, the rate of duty being 2 cents. per kg.

The Board of Trade are also informed that the 2 per cent. surtax imposed in 1909 on imported goods for the creation of a currency redemption fund was not abrogated by the new Tariff Law, and is therefore still in force.

New regulations have been laid down regarding the tariff treatment of commercial travellers' samples. Samples of goods imported will be admitted free of duty provided the following conditions are fulfilled:—

(1) That samples of all kinds of merchandise having no commercial value are presented in such a form as to be useless for any other purpose than that of taking orders.

(2) and (3) refer to tissues only.

(4) That cables and metal wires do not exceed 8 CM. in length.

(5) and (6) refer to wines and spirits and plated ware only.

(7) Other samples of merchandise which cannot be rendered useless and which may, therefore, be capable of being sold, will pay Customs duty on importation. The importer will, nevertheless, be entitled to a refund by the Customs Authorities of the amount paid in respect of import duty with a reduction of 25 per cent. provided he re-exports them within one year from the time of declaring them for importation.

AUSTRALIA.—The Customs Authorities have issued a decision providing for the free importation of the following machine tools, with effect from February 16th last: Electrical hand riveting and hand chipping machines for hammers.

NEW ZEALAND.—The Customs Department have decided that "Ceag" electric miners' safety lamps may be admitted free of duty on importation; cells for the same, if imported detached, will be liable to a duty of 20 per cent. under the British preferential tariff and 30 per cent. under the general tariff on foreign goods.

FRANCE.—The French Customs have decided that cylindrical or semi-cylindrical conduits of common earthenware for laying wires or cables are to be dutiable on importation as drain pipes at the rate of 40 cents. per 100 kgs. gross. (2d. per cent. gross). Tools imported with the machines for which they are intended, in so far as such tools can be fitted on the machine at one and the same time, are to be considered as integral parts of the machine and included in the dutiable weight thereof.

UNITED STATES.—The Treasury Department have laid down that travellers' samples entered under bond for re-exportation, if they can be used otherwise than as samples are to be marked by the Customs by means of a cord and seal in such a manner as will prevent the removal of the cord and seal without either breaking the same or destroying the article. A tag bearing the name of the port of entry, the number of the entry, the name of the importer and the numbers of the bond must also be attached to the cord. Articles not readily susceptible of marking by cord and seal may be marked for identification in such a manner as the nature of the article will allow, and the examiner must give on the invoice a description of the manner in which the articles have been marked. Such marking and labelling is to be done at the expense of the importer.

NICARAGUA.—The Nicaraguan Government have issued an order providing that, to date from May 1st, the fees which are charged for Consular invoices for goods consigned to Nicaragua must be paid at the port where the goods are discharged in Nicaragua and not, as hitherto, at Nicaraguan Consulates in the United Kingdom where the invoices are obtained.

NEW PATENTS APPLIED FOR, 1914.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

12,189. "Means for giving a series of electric flashes of light from a bicycle or the like when in motion." C. H. HULBERT. May 18th.

12,191. "Apparatus for electric lighting, heating, and ventilating of railway carriages or other moving vehicles or for equivalent purposes." T. FERGUSON and J. R. JOHNSTONE. May 18th. (Addition to 9,009/13.)

12,210. "Electric fuse devices, safety cartridges, or the like." SIEMENS BROS. DYNAMO WORKS, LTD. May 18th. (Siemens-Schuckertwerke G.m.b.H., Germany.) (Complete.)

12,232. "Telephone-call recorders." D. J. MCGAURAN. May 18th. (Convention date, July 22nd, 1913, Australia.) (Complete.)

12,233. "Telephone-call recorders." D. J. MCGAURAN. May 18th. (Convention date, July 22nd, 1913, Australia.) (Complete.)

12,253. "Relays." I. LASSNER and J. LASSNER. May 18th. (Convention date, May 21st, 1913, Hungary.) (Complete.)

12,259. "Method and means for the production of sustained electric oscillations, particularly for radiotelegraphy and radiotelephony." W. J. MELLERSH-JACKSON. May 18th. (Fratelli Marzi di G.B., Italy.) (Complete.)

12,277 "Apparatus for electric signalling, especially applicable to wireless telegraphy." A. F. SYKES. May 18th.

12,282. "Polyphase dynamos and motors." A. HEYLAND. May 18th. (Convention date, June 14th, 1913, Germany.) (Complete.)

12,285. "Electric motors." H. F. CHRISTIE. May 19th.

12,347. "Electric ignition mechanism for combustion engines." E. MICHIELS. May 19th. (Convention date, May 19th, 1913, Belgium.) (Complete.)

12,350. "Magnetos and the like." H. FORD. May 19th. (Addition to 15,636/13.) (Complete.)

12,358. "Manufacture of wire." WESTINGHOUSE METALLFADEN GLUHLAMPENFABRIK G.M.B.H. May 19th. (Convention date, May 26th, 1913, Austria.) (Complete.)

12,359. "Electric incandescent lamps." WESTINGHOUSE METALLFADEN GLUHLAMPENFABRIK G.M.B.H. May 19th. (Convention date, May 27th, 1913, Austria.) (Complete.)

12,361. "Selenium cells especially adapted for use in connection with telegraphy." J. S. WITHERS. May 19th. (Kenwrick Cecil Cox, Norfolk Isle.)

12,364. "Improvements in or relating to receivers for wireless telegraphy and telephony for diminishing atmospheric influence on such receivers. P. O. PEDERSEN. May 19th. (Complete.)

12,372. "Light-ray switch." P. DRESLA. May 19th. (Complete.)

12,386. "Electricity prepayment meters." BRITISH INSULATED & HELSBY CABLES, LTD., and L. B. WILSON. May 20th.

12,402. "Burglar alarm to be used in connection with a telephone or powerful whistle." W. JACKSON. May 20th.

12,404. "Connectors for electric cables." E. PRIDDLE. May 20th.

12,408. "Reinforced plaster composition electrical cooking-stove and grill combined." S. TURNER. May 20th.

12,430. "Holder for shades of electric incandescent lamps." R. PFAFFLE. May 20th. (Complete.)

12,443. "Insulator for the overhead conductors of electric lines." F. LIBANO. May 20th. (Convention date, May 31st, 1913, Germany.) (Complete.)

12,451. "Electric liquid-heating means." J. J. GLASS. May 20th.

12,455. "Dynamos." H. LEITNER. May 20th.

12,479. "Electric welding." ALLGEMEINE ELEKTRICITATS GES. May 20th. (Addition to 8,595/14. Convention date, May 20th, 1913, Germany. (Complete.)

12,483. "Circuit arrangements for automatic or semi-automatic telephone installations." SIEMENS & HALSKE AKT. GES. May 20th. (Addition to 16,538/13. Convention date, May 20th, 1913, Germany.) (Complete.)

12,493. "Method of controlling the attachment of lump iron to suspended electro-magnets." J. D. LATIMER. May 21st.

12,495. "Automatic contact-breaker controlled by the foot or feet." May 21st. F. R. FRANCKE.

12,551. "Electrical heating-apparatus." A. F. BERRY. May 21st.

12,555. "Mountings or fittings for incandescent electric lamps." W. C. WISE (trading as P. Chappius & Co.). May 21st. (Complete.)

12,562. "Relays." A. C. BROWN. May 21st.

12,576. "Safety interlocking system preventing erroneous tripping of sub-station electric machines and the like." F. V. GOUGH. May 22nd.

12,599. "Fittings for metallic conduit systems for housing electrical conductors." SIMPLEX CONDUITS, LTD., and L. M. WATERHOUSE. May 22nd.

12,605. "Electric heating-devices." G. PATE and A. R. WOOD. May 22nd. (Complete.)

12,614. "Combined switch and ignition tell-tale." G. F. METZGER. May 22nd.

12,633. "Systems of radio-control." J. H. HAMMOND, JUN. May 22nd. (Divided application on 13,310/13. June 9th.) (Complete.)

12,641. "Dynamo electric machines." N. W. STORER. May 22nd. (Convention date, May 22nd, 1913, United States.) (Complete.)

12,642. "Overcharge preventers for the charging circuits of secondary batteries." W. A. TRIER. May 22nd.

12,643. "Motor-car and like electric lamps and their attachment to supporting brackets." W. W. SOUTTER. May 22nd.

12,652. "Cathodic detectors." F. HOLWECK. May 22nd. (Addition to 2,206/14.) (Complete.)

12,656. "Telephone set." P. L. JENSEN and E. S. PRIDHAM. May 22nd. (Complete.)

12,659. "Controlling apparatus for electrical lifts." A. W. PENROSE & Co., LTD., and M. OWEN. May 22nd. (Complete.)

12,662. "Construction of apparatus for automatically controlling locomotives or electric motors when passing signals at danger or rounding curves." W. C. MINIFIE and J. H. BARCLAY. May 22nd.

12,666. "Electro-magnetic talking machines." C. SONTAG. May 22nd. (Convention date, May 24th, 1913, Germany.) (Complete.)

12,682. "Switch for incandescent lamp fittings." W. J. MELLERSH-JACKSON. May 22nd. (Geb. Jaeger, Germany.) (Complete.)

12,720. "Light high-power electric accumulator." MARQUISE DES LIGNERIS NEE C. M. B. TAILHANDIER DU PLAIX. May 23rd. (Complete.)

12,721. "Electrical signalling-apparatus." W. A. HEYES and L. O. HEYES. May 23rd. (Complete.)

12,722. "Method of producing electric currents by induction." H. MUNRO. May 23rd.

12,746. "Electric light pendants." W. O. TEASDALE. May 23rd. (Complete.)

12,757. "Lamp holders." C. G. M. BENNETT and C. H. JEFFCOAT. May 23rd.

EXPIRING PATENTS, TAKEN OUT IN 1900.

(*Continued from page* 932.)

5,649. "Electric Telegraphs." Brown, S. G., and Dearlove, J. A. L. March 26th. Relates to arrangements especially for submarine working by duplex and other systems. The relays, such as described in Specification No. 1,434, A.D. 1899, are preferably coupled up by means of insulating-springs to a second heavy damping-coil which may be double-wound and arranged in the relay circuits so as to emphasize the signal currents, otherwise distorted by the charging of the condenser.

6,034. "Fire Alarms." Oatway, G. H. March 31st. Relates to an alarm which is only started by sudden rises of temperature, and which may be used in mines and ships as well as in other places. A wire, preferably of copper, is stretched between the ends of a more massive frame of the same material. When this system is suddenly heated the wire expands faster than the frame, and the consequent sag lowers a weight till it makes contact with a terminal and thus closes the alarm circuit, which also contains one of the magnets of the indicator, and thereby indicates the locality of the fire. Several modifications are described.

6,701. "Electrolysis." Strecker, O. C. April 10th. Plates of metals or alloys for use in lithographic printing are provided by electrolysis with a water-retaining layer. To form the layer, the plate is arranged as an anode, if a continuous current be used, the electrolyte employed being dilute aqueous salt solution, of which the anion forms with the metal of the plate the required insoluble or nearly insoluble layer, or forms a layer which may be subsequently converted into the required layer by chemical treatment. To remove the layer, the plate is used as a cathode. Various modifications are described.

7,108. "Magneto-electric Machines." Simms, F. R., and Bosch, R. April 17th. A magneto-electric machine, chiefly for use in connection with electric ignition devices for internal-combustion engines, is so arranged that the armature, or an inductor enclosing the same, shall be continuously rotated, either directly or indirectly, by the motor crank shaft.

7,272. "Electrolysis." Baker, H. April 19th. Carbon electrodes, such as rods, are passed through the side or top of a cell, and their projecting ends are connected in pairs by two rigid contact-plates having a bolt and a tightening-nut. The several pairs of electrodes are connected up in parallel by a copper band.

7,471. "Electric Telegraphs." Brown, S. G. April 23rd. Relates to arrangements and systems of diplex telegraphy capable of being duplexed and thus converted to quadruplex. The transmitting apparatus may be run synchronously, or the signals may be allowed to overlap, in which case the receiving-apparatus is provided with rotating curbing relay arms by which a varying resistance is thrown into the local correcting circuit for the purpose of varying the local correcting current in accordance with the varying signal current, due to overlapping. The signals may be received by a siphon recorder, in which case the curve traced by the pen will be a compound curve; or the signals may be analysed by employing a rotating drum relay such as described in Specification No. 1,434, A.D. 1899, and separating the signals out to the distinct receivers.

7,678. "Electric Telegraphs." Pollak, A., Egger, J., and Silberstein, F. April 25th. Relates to a system of telegraphy in which perforated code signals are automatically transmitted and reproduced at the receiving-station in the form of written characters. The apparatus is described for use when an alphabet of forward or open loops only is employed, or when the alphabet includes backward or closed loops; in the latter case the code signals are divided between two lines, so as to produce two motions, preferably at right-angles, at the receiving station.

8,208. "Electric Switches." British Thomson-Houston Co. (Hewlett, E. M.) May 3rd. A switch, which is adapted for high-potential currents, is arranged with the breaking points in closed vessels containing oil, and is operated preferably by pneumatic means controlled from a distance.

(*To be continued.*)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1913.

3,103. WIRELESS TELEGRAPH, TELEPHONE OR SUBMARINE SOUND-SIGNALLING SYSTEMS. Radio Signal Co., W. H. Shephard and A. E. McKechnie. February 6th.

5,568. GAS-DETECTING APPARATUS FOR PORTABLE ELECTRIC HAND LAMPS. G. J Ralph. March 6th.

7,365. SPARKING PLUGS. H. G. Longford, W. W. Longford and W. A. Clark. March 28th. (September 20th, 1913.)

7,784. DYNAMO-ELECTRIC MACHINES. Allgemeine Elektricitats Ges. April 2nd. (April 2nd, 1912.)

7,805. ELECTRICAL CONDUCTORS AND SUPPORTING MEANS FOR SAME. British Insulated & Helsby Cables, Ltd., W. M. Mordey, J. M. Astley and D. B. Saunderson. April 3rd.

10,282. APPARATUS FOR SYNCHRONIZING MOTION AND SOUND REPRODUCTIONS. E. H. Amet. May 1st.

10,396. ELECTRICALLY-OPERATED DIAPHRAGM SIGNAL HORNS. F. Knabl, M. Greenwald and H. A. Farman. May 2nd. (Cognate application 24,907/13.)

10,416. ELECTRIC MOTOR CONTROL APPARATUS. A. H. Railing and C. C. Garrard. May 3rd.

10,608. WINDINGS OF DYNAMO-ELECTRIC MACHINES AND OTHER ELECTRICAL APPARATUS. Allgemeine Elektricitats Ges. May 5th. (May 3rd, 1912.)

10,655. APPARATUS FOR RECEIVING SUBMARINE SOUND SIGNALS. Signal Ges. May 6th. (December 27th, 1912.)

10,704. SIGNALLING APPARATUS. Graham & Latham, Ltd., and L. J. Graham. May 6th.

10,717. ELECTRIC SWITCH OPERATING-MECHANISM AND THE LIKE, FOR CAUSING THE ACTUATION OF SIGNALS ON MOVING OBJECTS. E. J. Pace and O. E. Kellum. May 6th.

10,864. TELEPHONE EXCHANGE SYSTEM. M. L. Johnson. May 8th.

10,918. INCANDESCENT ELECTRIC LAMPS. British Thomson-Houston Co. (General Electric Co.) May 8th.

10,919. WINDINGS FOR DYNAMO-ELECTRIC MACHINES. British Thomson-Houston Co. and H. W. Taylor. May 8th.

10,987. DEVICES FOR SECURING CONTACT WITH THE EARTH AT SPECIFIED DEPTHS FOR ELECTRIC TESTING PURPOSES. E. Ryan and H. W. Brown. May 9th.

11,106. WIRELESS TELEGRAPHY. Marconi's Wireless Telegraph Co. and C. P. Ryan. May 10th.

11,158. MARINERS' COMPASSES. Kelvin and James White, Ltd., F. A. King, and G. H. Alexander. May 13th.

11,240. HIGH FREQUENCY DYNAMO-ELECTRIC MACHINES. British Thomson-Houston Co. (General Electric Co.). May 13th.

13,308. ELECTRIC-MAGNETIC FRICTION COUPLINGS. P. Forster. June 9th. (June 8th, 1912.)

14,167. MACHINES FOR COVERING WIRE AND OTHER CORES WITH YARN AND THE LIKE. N. Stott. June 19th.

15,348. ELECTRICALLY ILLUMINATED LETTERS. H. Bey. July 3rd.

15,643. WIRING OF ELECTRIC LIGHTING INSTALLATIONS. F. Hodgson. July 7th.

15,968. CONTACT DEVICES FOR ELECTRICAL TESTING PURPOSES. Evershed and Vignoles, Ltd., W. Clark and G. Senior. July 10th.

16,684. ELECTRIC BATTERIES AND ACCUMULATORS. F. Sablon. July 21st.

17,189. STARTING-GEAR FOR INTERNAL-COMBUSTION ENGINES AND THE LIKE. H. Leitner. July 26th.

18,900. DETACHABLE DESK FOR USE WITH A TABLE TELEPHONE OR OTHER SUITABLE SUPPORT. J. D. Joyce and H. C. Lumb. August 20th.

19,782. SOLUTION FOR USE IN LEAD ACCUMULATOR CELLS. P. Rabbidge. September 1st. (September 2nd, 1912.)

19,838. MACHINES FOR SEALING SUPPORTING WIRES INTO THE BEADS OF THE GLASS RODS OF METAL FILAMENT ELECTRIC INCANDESCENT LAMPS. September 2nd. J. Kremenezky (Firm of). (April 16th, 1913.)

21,143. VOLTMETER. J. Stephenson. September 18th. (Convention date not granted.)

23,553. APPARATUS FOR EXHIBITING PICTURES, ADVERTISEMENTS AND THE LIKE. W. J. Mellersh-Jackson (Elektro-Reklame Ges). October 17th. (Addition to 5,029/13).

25,046. ELECTRICAL REGULATING DEVICES. A. G. Bloxam (Robert Bosch, Firm of). November 3rd.

26,684. INSULATED ELECTRIC CONDUCTORS. Western Electric Co. (Woodward, acting for Western Electric Co.). November 20th.

27,988. ARRANGEMENTS FOR STARTING AND REGULATING DIRECT CURRENT ELECTRIC MOTORS. F. Cumot. December 5th. (Divided application on 7,983/13, April 4th. Addition to 8,108/12.)

29,418. ELECTROLYTIC FURNACES FOR THE PRODUCTION OF LIGHT METALS. G. B. Ellis (Sodium Process Co.). December 20th.

29,448. ELECTRICAL RELAYS. Kemp and Lauritzen (Firm of). December 20th. February 27th, 1913.)

1914.

91. MEANS FOR INTERMITTENTLY ESTABLISHING AN ELECTRIC CIRCUIT FOR INDICATING OR RECORDING THE LEVEL OF LIQUIDS AND FOR OTHER PURPOSES. J. B. Hotham and M. J. Wilson. January 1st.

970. SWITCHES FOR ELECTRIC HAND LAMPS AND THE LIKE. G. F. Hitzelberger and New British Ever Ready Co. Jan. 13th.

3,992. PORTABLE ELECTRIC BATTERY LAMPS. B. Pordes. February 16th.

5,535. WIRELESS TELEGRAPHY. G. Leimbach. March 4th. (March 4th, 1913.)

6,074. ELECTRIC STARTING AND IGNITION SYSTEMS FOR INTERNAL-COMBUSTION ENGINES. C. F. Kettering & W. A. Chryst. March 10th. (November 20th, 1912. Divided application on 7,545/13, March 31st.)

7,788. DEVICE FOR OBTAINING RONTGEN-RAY EXPOSURES. G. Bucky. March 27th. (April 7th, 1913. Addition to 2,815/14.)